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U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS—BULLETIN 223.

A. C. TRUE, Director.

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IN PHILADELPHIA, PA.,

BY

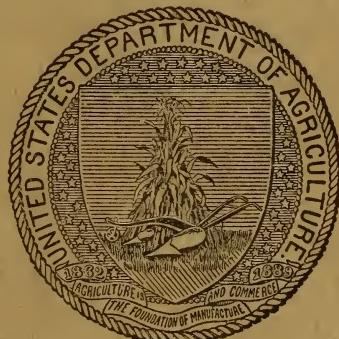
MISS EMMA SMEDLEY AND R. D. MILNER,

AND

DIETARY STUDIES IN PUBLIC INSTITUTIONS  
IN BALTIMORE, MD.,

BY

H. L. KNIGHT, H. A. PRATT, AND C. F. LANGWORTHY.



WASHINGTON:

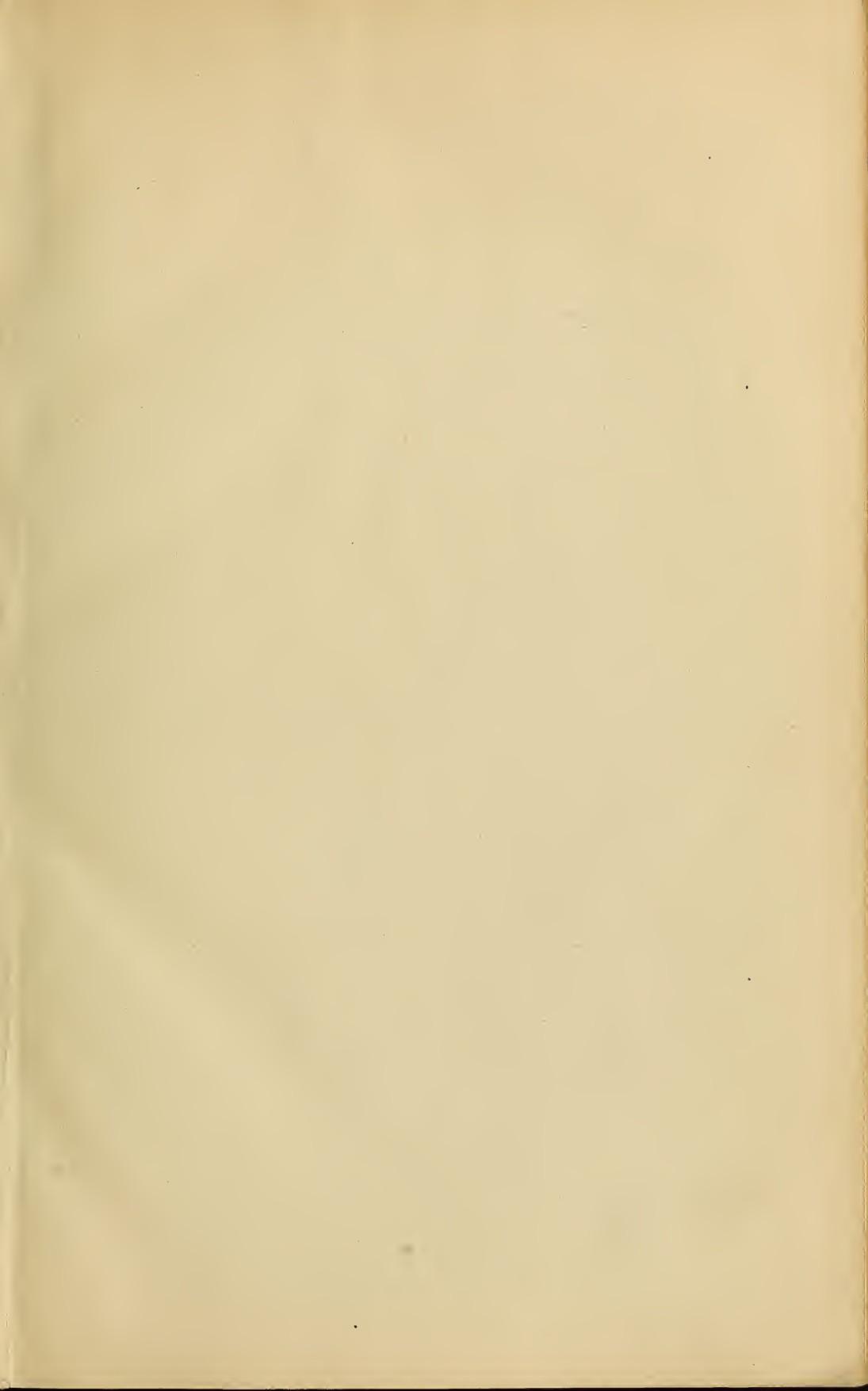
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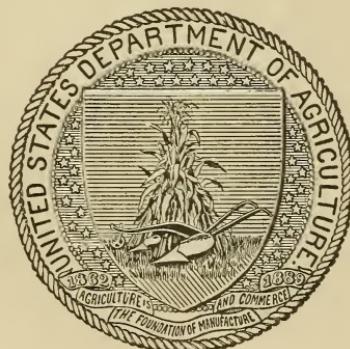
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**OFFICE OF EXPERIMENT STATIONS.**

A. C. TRUE, D. Sc., Director.

E. W. ALLEN, Ph. D., Assistant Director and Editor of Experiment Station Record.

C. F. LANGWORTHY, Ph. D., Expert in Nutrition.

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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
OFFICE OF EXPERIMENT STATIONS,  
*Washington, D. C., October 15, 1909.*

SIR: I have the honor to transmit herewith, and to recommend for publication as Bulletin No. 223 of this Office, a report on the results of 8 dietary studies in homes for the aged and 3 in orphan asylums in Philadelphia and Baltimore, carried on by R. D. Milner, Miss Emma Smedley, H. L. Knight, H. A. Pratt, and C. F. Langworthy.

The institutions were of two types, namely, those supported by public funds and those supported largely by private endowment.

One object of the investigation was to secure data regarding the food consumption of aged men and women and children for use in formulating dietary standards for such individuals, in comparison with an adult man in full vigor. It is often a matter of great importance, particularly in the expenditure of public funds, to determine whether the diet of an institution corresponds in all respects to reasonable standards, and one of the principal objects of the investigation here reported was to test the value for making such comparisons of methods elaborated in cooperation with the nutrition investigations of this Office. The results indicate that the object sought can be attained, and demonstrate that with the data now available it is possible for the nutrition expert to pass upon the dietary problems of an institution in the same way that a public accountant can pass upon the financial affairs of a commercial enterprise, and it seems fair to say that the data obtained are as useful in the one case as in the other.

Acknowledgment should be made to the managers of the several institutions studied and to the matrons and other officials for making the work possible and aiding it in many ways.

Respectfully,

A. C. TRUE,  
*Director.*

Hon. JAMES WILSON,  
*Secretary of Agriculture.*



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# DIETARY STUDIES IN PUBLIC INSTITUTIONS.

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## DIETARY STUDIES IN PHILADELPHIA.

By Miss EMMA SMEDLEY and R. D. MILNER.

### INTRODUCTION.

As a part of the nutrition investigations of the Office of Experiment Stations, dietary studies were made in a home for aged women and in an orphan asylum in Philadelphia, the results of which are here reported. The work was carried on in cooperation with Drexel Institute and was undertaken primarily to secure data regarding the food consumption of aged persons and children and also as a demonstration of the importance of such studies as a means of judging of the effectiveness of the system of institution management followed and the nutritive value and character of the diet in comparison with dietary standards.

### DIETARY STUDY IN OLD LADIES' HOME.

The home for aged women in which this study was made is under the care of a benevolent association. In January, 1907, the home celebrated its ninetieth anniversary. During its many years of usefulness it has had as its managers many able women, and not a few of the present managers are granddaughters or great-granddaughters of the organizers of the society.

The building now occupied was erected in 1887. It is large, commodious, and surrounded by a spacious yard, in which are many trees and a flower garden. It is so arranged that all the rooms occupied by the old ladies are sunny a part of the day. On each floor there are sitting rooms for the inmates, and a library has been provided for them. One section of the second floor is used for an infirmary, where the feeble and sick may be made more comfortable under the care of a trained nurse and her assistants.

There were 113 old ladies in the asylum at the time the dietary study was made, 10 of whom were between the ages of 65 and 70, 73 between 70 and 80 years, 20 between 80 and 90 years, and 10 between 90 and 100 years.

The employees consisted of a matron and 1 assistant; a trained nurse and 5 assistants; 12 women, including cooks, laundresses, and housemaids; and 3 men, an engineer and his assistant and a "chore" man. One man was away at the time of the dietary study.

The general health and happiness of the whole family was remarkably good. The old ladies assist in preparing the vegetables for the table, and sew or perform other light duties about the house in so far as they are able.

#### STAPLE FOODS AND METHODS OF SERVING.

The matron buys all food, selected according to the market supply, under the direction of the managers. She also arranges the menus and gives her personal oversight to the preparation and serving of the meals. There is more variety in the diet than is usually found in an institution; it is like a home table, and the food is well prepared, attractive, and appetizing.

All food is prepared in the basement kitchen and carried by dumb-waiter to the main dining room on the first floor and to the infirmary on the second floor. The same food is served to all of the employees. Extra dishes, as beef tea, mutton broth, albumen water, and gruels are prepared in the infirmary for those requiring special diet.

The bread is supplied by a baker who makes it in 2-pound loaves, 8 loaves to a pan, thus avoiding a large amount of crust which would probably be wasted.

Coffee, tea, and milk are always served for breakfast, tea or coffee and milk for dinner, and tea and milk for supper.

An examination of the menus showed that rice is served nearly every day as well as potatoes and a green vegetable, the rice sometimes taking the place of dessert, when it is eaten with sugar and milk.

Meat left from dinner is usually served to the few who wish it for supper. Roast beef is always served cold for dinner on Sunday. Cake of some kind is served Sunday night in place of the hot dish which is used on week days.

Food is allowed in unlimited quantities, and the fact that there is remarkably little waste from the table proves that it is appetizing.

The following is a representative sample of the menus used during the week of the study:

#### MENU FOR TUESDAY, MAY 14.

**Breakfast:** Oatmeal, dry flaked cereal, chipped beef, potatoes, bread and butter, tea, coffee, milk, sugar.

**Dinner:** Fried ham, mashed potatoes, lettuce and dressing, boiled rice, coffee, bread and butter.

**Supper:** Corn muffins, butter, tomato preserves, tea, milk.

### METHOD OF MAKING THE DIETARY STUDY.

As all food is prepared in one kitchen, it was necessary to record only the weights of food materials on hand at the beginning of the study, as bread, butter, milk, sugar, and meat; all supplies purchased or taken from the storeroom during the week, and, at the end of the week, the weights of materials on hand. Meat was weighed as purchased and vegetables as prepared for cooking. Many loaves of bread were weighed and the average weight used in the calculations. The same method was employed for cereal breakfast foods which were purchased in boxes.

The weight of table waste was also recorded each day.

From these figures are calculated the nutritive value of the food served and wasted per person per day.

It was not thought necessary to analyze any food materials, the composition being assumed from a previous publication.<sup>a</sup> The figures in parentheses following the names of food materials in the table on page 10 refer to manuscript tables on file in this Office showing the data thus used.

The fuel value of the foods used was calculated by the use of factors given in Principles of Nutrition and Nutritive Value of Foods.<sup>b</sup>

It was assumed that the composition of the total waste was the same as the average composition of the total food supplied.

### DETAILS OF THE DIETARY STUDY.

This study covered a period of seven days, beginning May 14, 1907, during which time 2,811 meals were served, 2,365 to the old ladies, 406 to the women employees and occasional visitors, and 40 to the men employees.

Several old ladies and a number of the employees were away one or more meals during the week.

The total food materials used, with their cost and nutrients, are given in the table on page 10, at the end of which are also given the cost and nutrients supplied per woman per day.

To determine the amount of food eaten by the employees, it was assumed that each man consumed 125 grams of protein, 125 grams of fat, and 400 grams of carbohydrates per day, and each woman 0.8 of this amount. The amounts of nutrients thus estimated were subtracted from those of the total food to give the amounts actually eaten by the inmates, and from these last the amounts per woman per day were calculated. It was impossible to distinguish between employees and inmates in considering the daily cost, which is, therefore, calculated per person per day.

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<sup>a</sup> U. S. Dept. Agr., Office Expt. Stas. Bul. 28 revised, and Farmers' Bul. 249.

<sup>b</sup> U. S. Dept. Agr., Farmers' Bul. 142.

*Weight, cost, nutrients, and fuel value of total food and that consumed per woman per day, dietary study No. 691.*

Kinds, amounts, and cost of material.	Cost.	Protein.	Fat.	Carbo-hydrates.	Fuel value.
<b>ANIMAL FOOD.</b>					
Beef, veal, and mutton: Beef, chipped, dried, 12.8 pounds, \$2.30 (9); ribs, 112 pounds, \$17.92 (3); rump steak, 37.5 pounds, \$6.66 (2); veal, liver, 11 pounds, \$2 (6); lamb, chops, 10 pounds, \$1.80 (4); shoulder, 39.5 pounds, \$6.22 (5).....	Dollars. 36.90	Grams 15,754	Grams. 18,653	Grams.	Calories. 229,029
Pork, etc.: Bacon, 17 pounds, \$2.89 (7); ham, with bone, 23.8 pounds, \$3.80 (8); salt pork, 6 pounds, \$0.90 (9); lard, 2.5 pounds, \$0.29 (10).....	7.88	2,496	10,902	.....	107,014
Fish, etc.: Mackerel, 19 pounds, \$2.85 (12); shad, 64 pounds, \$10 (11); oysters, canned, 3 pounds, \$0.10 (62).....	12.95 9.50	6,775 4,102	4,617 3,206	53	68,410 44,944
Eggs, 76 pounds, \$9.50 (14).....	53.51	15,056	45,015	21,570	547,137
Dairy products: Butter, 71.5 pounds, \$27.17 (15); buttermilk, 30 pounds, \$0.36 (16); cheese, 4 pounds, \$0.62 (18); milk, 922 pounds, \$25.36 (17).....	120.74	44,183	82,393	21,623	996,534
Total animal food.....					
<b>VEGETABLE FOOD.</b>					
Cereals: Barley, pearlized, 1.3 pounds, \$0.05 (20); corn meal, 21 pounds, \$0.42 (20); oatmeal, 21 pounds, \$0.63 (19); rice, 13.5 pounds, \$0.95 (24); wheat flour, 61.3 pounds, \$1.54 (25); farina, 5 pounds, \$0.35 (22); breakfast food, 9 pounds, \$1.10 (32); bread, white, 146 pounds, \$5.48 (27); bread, graham, 48.5 pounds, \$1.70 (28); breakfast rolls, 18 pounds, \$0.96 (29); cake, Dutch, 21 pounds, \$1.12 (30); cookies, sugar, 5.5 pounds, \$0.55 (31); macaroni, 3.5 pounds, \$0.28 (33).....	15.13	15,891	3,773	102,863	508,599
Sugars and starches: Molasses, 2 pounds, \$0.12 (35); sugar, granulated, 185.5 pounds, \$9.27 (34); corn-starch, 2.8 pounds, \$0.21 (36).....	9.60	22	.....	85,894	343,663
Vegetables: Beans, pea, dried, 10 pounds, \$0.45 (37); beans, Lima, 7.8 pounds, \$0.47 (38); cabbage, 39.5 pounds, \$1.30 (39); lettuce, 32.5 pounds, \$1.70 (41); onions, 2.5 pounds, \$1 (43); potatoes, 188.5 pounds, \$3 (45); potatoes, 44 pounds, \$1 (46); radishes, 3.8 pounds, \$1 (47); spinach, 52 pounds, \$2.60 (48); tomatoes, 1 pound, \$0.10 (50).....	12.62	4,900	416	26,101	127,702
Fruits: Bananas, 78 pounds, \$2.88 (54); rhubarb, 24.5 pounds, \$1.50 (58); strawberries, 70 pounds, \$7.85 (60); plums, canned, 25 pounds, \$1 (57); prunes, 10 pounds, \$0.75 (56); tomatoes, preserved, 20.5 pounds, \$0.50 (58).....	14.48 .75	871 .....	430 454	18,516 .....	81,375 4,041
Olive oil, 1 pound, \$0.75 (61).....					
Total vegetable food.....	52.58	21,684	5,073	233,374	1,065,380
Total food.....	173.32	65,867	87,466	254,997	2,061,914
Waste.....		5,070	6,854	19,906	160,910
Total food consumed.....		60,797	80,612	235,091	1,900,995
Food of employees.....		15,313	15,313	55,007	417,561
Food consumed by inmates.....		45,484	65,300	180,083	1,483,434
Food consumed per woman per day.....	a .18	58	83	228	1,882

*a Per person per day; see page 9.*

#### DISCUSSION OF RESULTS.

According to the table each inmate of the home received during the time of the study 58 grams of protein and 1,882 calories of energy a day, at a cost of 18 cents. The amounts of nutrients thus supplied are noticeably lower than those in the Baltimore studies reported elsewhere in this bulletin, or than almost any others on record in the investigations of this Office for persons of similar requirements. Since there was no limit to the amount of food served it is evident that the

subjects satisfied their hunger, and the comparatively small table waste seems a proof that they found the food appetizing. The question of the adequacy of the diet to their needs is discussed in another section of this bulletin (see p. 40).

The cost, 18 cents per person per day, is not excessive, considering the variety of foods served. If the strictest economy were necessary, materials could undoubtedly be selected which would furnish as large quantities of nutrients for a smaller sum or larger quantities for the same sum, but probably not with as appetizing a variety, especially in the matter of fruit and vegetables. Such pleasing variety in the diet actually adds to its nutritive value by stimulating the flow of digestive juices, a consideration of especial importance in the case of persons in whom, as in the subjects of this study, the vital processes tend naturally to become sluggish.

In general, it may be said that the diet was in reasonable accord with commonly accepted standards and that the dietary problems were handled in accordance with the requirements of good management. The food was adequate, well prepared and served, and the cost reasonable as compared with the resources.

#### **DIETARY STUDY IN AN ORPHAN ASYLUM.**

The orphanage where the dietary study was made is located in a suburb about 13 miles from Philadelphia. It is under management similar to the home for old ladies in which dietary study No. 691 was carried on. At its foundation in 1814 it was the only institution of the kind in Philadelphia, and it has always occupied a high place among public institutions of the city. In 1906 it moved into its present quarters, where it has the advantages of country surroundings.

The buildings, admirable in their external construction and an ornament to the neighborhood, have proved thoroughly adapted to the purposes of the asylum. Well lighted and well ventilated, and provided with every convenience, they furnish to the children the same provisions for comfort and health which would be expected in a private house. The surrounding grounds afford opportunity for exercise in the open air and for instruction in farming and gardening.

The children have a very free and happy life, and were all in excellent health. All who are over 6 years old attend school each day in a school maintained in the asylum, where, beside their regular studies, the boys receive instruction in carpentry and the girls in sewing, housework, and stenography. Besides going to school each child has some regular household duty to perform, under the supervision and instruction of a care taker. The girls do all the work in their dormitories and halls, help in the kitchen, dining rooms, and laundry, wash all the dishes, and have care of the pantries. The older girls do their own sewing and also help with the mending for

the smaller girls. The boys take care of their dormitories and halls, carry coal for the cook, and assist the man in the care of the lawn and garden. The boys are also taught to sew and the older ones mend the stockings for the younger ones. Each older boy and each girl is made responsible for the conduct of a younger child. The family feeling is especially encouraged, and the matron endeavors to give the children a mother's care and sympathy.

There were 80 children in the home at the time the study was made, their ages ranging as follows:

*Number and age of children in orphan asylum.*

Girls.	No.	Boys.	No.
Between 15 and 18 years.....	8	Between 13 and 14 years.....	6
Between 13 and 14 years.....	10	Between 12 and 13 years.....	5
Between 10 and 12 years.....	8	Between 10 and 11 years.....	4
Between 6 and 9 years.....	11	Between 6 and 9 years.....	14
Under 6 years.....	7	Under 6 years.....	7
Total girls.....	44	Total boys.....	36

The average age of the girls was a little less than 11 years; that of the boys a little less than 9 years.

The officers of the home, 11 in all, at the time the study was made, included a matron and assistant, 2 teachers, nurse, seamstress, and 5 care takers. A cook, 3 laundresses, and 1 man were also employed.

The matron buys most of the table supplies in Philadelphia. Milk, which furnishes the largest item in the menu, is supplied from a well-equipped dairy in the neighborhood. Green vegetables and eggs are also purchased from a neighboring farm.

The meals are served at regular hours each day, and half an hour is allowed for each meal, the children being allowed all they will eat in that time. The matron and caretakers are always in the dining room while the children are eating, to help the little ones and to encourage all to be neat, careful, and thoughtful.

The diet of the children is very simple, as will be gathered from the menu for a representative day. They are not allowed to have food between meals, except occasionally as a treat.

The officers' meals are served in another room after the children are through, and their food is different from that served to the children. The other employees are also given a diet slightly different from that of the children. The menu for the children for a representative day during the time of the study, May 18 to May 24, 1907, was as follows:

MENU FOR SATURDAY, MAY 18.

Breakfast: Oatmeal, milk, sugar, bread, butter.

Dinner: Frizzled beef, hard-boiled eggs, bread, butter, milk.

Supper: Stewed peaches, bread, butter, milk; pudding to a few older girls.

### METHOD AND RESULTS OF THE DIETARY STUDY.

In order to avoid the confusion which might otherwise arise between the food served to the children and that served to the officers and employees, all the materials served to the children were measured just before serving. The table waste from each kind of food was also separately measured and subtracted from the amount served. The results of the study as given in the table below therefore represent the amounts actually eaten by the children.

The composition of the food materials was assumed from data in earlier publications.<sup>a</sup> The significance of the figures in parentheses in the table was explained on page 9.

It was not feasible to include the cost of food in the observations made during this study, as so much of the food, i. e., milk and garden produce, was of home production.

The study covered a period of seven days, beginning May 18, 1907. There were 80 children at the orphanage for the first four days, when one girl became of age and left the home. All calculations are therefore made for 79.5 children for one week, or one child for 556.5 days.

The detailed results of the study are given in the following table:

*Weight of total food and nutrients and fuel value per child per day, dietary study No. 692.*

Kinds and total amounts of food materials.	Per child per day.			
	Protein.	Fat.	Carbo-hydrates.	Fuel value.
<b>ANIMAL FOOD.</b>				
Beef: Dried, chipped, 5 pounds (1); rump, steak, and stew, 41 pounds (2); ribs, 16.5 pounds (3).....	Grams.	Grams.	Grams.	Calories.
Lamb: Shoulder, 16 pounds (5).....	8.1	9.8	-----	120
Pork: Salt, 5.5 pounds (9).....	1.8	2.0	-----	25
Fish: Cod, fresh, 18 pounds (13).....	.3	2.5	-----	23
Eggs: 5.75 pounds (14).....	1.1	-----	-----	4
Dairy products: Butter, 14.75 pounds (15); milk, \$23.75 pounds (17).....	.6	.4	-----	6
Total animal food.....	22.3	37.1	33.6	554
	34.2	51.8	33.6	732
<b>VEGETABLE FOOD.</b>				
Cereals: Oatmeal, 16.75 pounds (19); cream of wheat, 18.25 pounds (23); corn flakes, 4 pounds (21); rice, 2 pounds (24); wheat flour, 5 pounds (25); white bread, 272.75 pounds (27); cookies, 11 pounds (31); rice pudding, 4 pounds (63).....	Grams.	Grams.	Grams.	Calories.
Sugars and starches: Cornstarch, 0.75 pound (36); molasses, 0.5 pound (35); sugar, 52 pounds (34).....	26.2	5.3	152.9	764
Vegetables: Beans, pea, dried, 12.5 pounds (37); corn, canned, 20.5 pounds (40); cucumbers, 20 pounds (42); onions, 2.5 pounds (48); peas, canned, 41.5 pounds (44); potatoes, 137 pounds (45); string beans, canned, 6.75 pounds (49); tomatoes, canned, 21 pounds (51).....	-----	-----	43.2	173
Fruits: Strawberries, fresh, 18 pounds (60); apples, dried, 7.5 pounds (53); peaches, dried, 6.75 pounds (55).....	6.9	.6	34.7	172
Total vegetable food.....	.3	.2	5.7	26
Total food.....	33.4	6.1	236.5	1,135
	67.6	57.9	270.1	1,867

<sup>a</sup> U. S. Dept. Agr., Office Expt. Stas. Bul. 28, revised, and Farmers' Bul. 249.

## DISCUSSION OF RESULTS.

It is ordinarily assumed that children the ages of those in this study or a trifle older require 0.6 of the amount required by a man at moderately active work. This would mean about 63 grams of protein and 2,100 calories of energy. The present study falls a little below this in energy, but shows 5 grams more protein. The general question of the food requirements of children and the adequacy of the diet in this and similar studies is discussed in a later section of the bulletin (see p. 87).

As regards the variety of materials used, the list presented in the table (p. 13) speaks well for the judgment of the purveyor. There is a greater variety of meats than in many such institutional dietaries, and also of vegetables and fruits. No data are available regarding the cost, but it is known not to have been beyond the means of the establishment, and undoubtedly provided a pleasing diet for the children.

As was the case in the Philadelphia home for aged women, the diet was adequate, whether judged by the nutrients and energy it supplied in comparison with commonly accepted dietary standards or by the physical condition of the children. The food was simple—as should be the case, particularly with children—and was wholesome and reasonable in cost, and was prepared and served with care and due regard to good standards.

## DIETARY STUDIES IN BALTIMORE.

By H. L. KNIGHT, H. A. PRATT, and C. F. LANGWORTHY.

### INTRODUCTION.

The following report comprises the results of a group of dietary studies made in charitable institutions for the aged and for the orphaned in Baltimore, Md. One object was the same as that of previous studies made in public institutions as a part of the nutrition investigations of the Office of Experiment Stations, namely, to secure accurate data regarding dietary conditions in comparison with the commonly accepted standards, in order that the management might know how satisfactory was the system followed and whether the food was adequate and met other reasonable requirements. There was, moreover, the further purpose of obtaining more information regarding the food consumption of elderly persons and children. Some investigations have been made in Europe regarding the nutritive demands of the aged, and from the data thus obtained it has been assumed that persons in the decline of life require 0.8 of the food of younger adults in corresponding circumstances, but this factor needs further verification. Even less investigation has been made regarding the food requirements of children beyond the age of infancy. It is evident that additional information on these points will be of immediate value to both the practical dietitian and the physiologist.

The institutions in which the present studies were carried on are believed to be typical of their respective kinds, namely, charitable institutions where rigid economy is absolutely essential, and institutions which are not of this character, but are rather to be considered as homes for aged persons and for orphan children, in which they may have the care and the comforts which are possible with more abundant resources. Bayview, the Baltimore city almshouse, in which the first series was made, is perhaps typical of public institutions where economy is essential. The next three studies were conducted in a home for aged women, a home for aged men, and the German Aged People's Home (Allgemeine Deutsche Greisenheimat), institutions under private management. The remaining two studies were made in children's homes, the Maryland Home for Friendless Colored Children, and the German Orphan Asylum (Allgemeines Deutsches Waisenhaus). In all cases the studies were carried on with the full consent of the managers and the helpful cooperation of the officials of the homes.

### COMPOSITION OF FOOD MATERIALS AND WASTE.

The foods used in these studies were for the most part so simple and similar to those in common use in this country that it was deemed

unnecessary to analyze them. The composition of almost all was, therefore, assumed from previous analyses of similar materials given in earlier publications of this Office. Composite samples of the waste from each of the last five studies and of samples of certain ingredients of the waste in the Bayview studies were, however, especially analyzed, as were also a few food materials. Only the percentage of protein was found in these analyses, which was obtained by multiplying the percentage of nitrogen by the factor 6.25. The heats of combustion were determined by the use of a bomb calorimeter, and from that the fuel value or energy was computed by means of the factors of availability commonly used in dietary studies.<sup>a</sup>

The table below gives the analyses specially made. In the detailed results of dietary studies which follow a reference number is given in parentheses after each material. These numbers refer either to this table or to manuscript tables kept on file in this Office, in which are shown the previous analyses which are assumed to represent the chemical composition of these materials.

*Protein, heat of combustion, and fuel value of materials analyzed, dietary studies Nos. 682-690.*

Reference number.	Food materials.	Protein (N × 6.25).	Heat of combustion per gram.	Fuel value per pound. <sup>b</sup>
ANIMAL FOOD.				
1	Beef, "sides and rattlers," cooked, edible portion.....	Per cent. 28.8	Calories. 3.059	Calories. 1.207
VEGETABLE FOODS.				
2	Cereals: Oatmeal, boiled.....	1.1	.370	.153
3	Rice, boiled.....	1.0	.553	.228
4	Bread, rye.....	10.6	3.018	1.246
5	Bread, wheat.....	9.8	2.481	1.024
6	Cake.....	8.1	4.316	1.782
7	Vegetables: Cabbage sprouts, boiled.....	4.0	.997	.412
Fruits:				
8	Apple butter.....	c. 5	c. 112	.444
9	Apple sauce (evaporated apples).....	.3	.990	.395
10	Do.....	c. 3	c. 561	.224
MISCELLANEOUS FOODS.				
Soup:				
11	Chicken.....	8.0	1.078	.421
12	Vegetable.....	2.5	.865	.337
13	Mutton, with vegetables.....	6.0	.713	.278
14	Beef, with vegetables.....	1.4	.550	.215
15	Do.....	6.9	1.188	.463
16	Do.....	4.1	.834	.325
17	Average, Nos. 12, 11, 15, and 16.....	d 4.9	d .859	.335
18	Gravy, for meat.....	1.9	.795	.310
WASTE.				
19	Broth, waste from soup, studies Nos. 682-685.....	.8	.128	.50
20	Composite sample, study No. 686.....	5.3	1.432	.598
21	Composite sample, study No. 687.....	4.7	1.350	.563
22	Table waste, composite sample, study No. 688.....	1.7	.496	.207
23	Kitchen waste, composite sample, study No. 689.....	4.3	1.104	.461
24	Composite sample, study No. 689.....	5.2	1.645	.687
25	Composite sample, study No. 690.....	3.6	1.140	.476

<sup>a</sup> U. S. Dept. Agr., Office Expt. Stas. Bul. 152, p. 13. For waste 92 per cent was taken, the figure there given for combination meals; for apple butter, 98 per cent, the figure for sugar.

<sup>b</sup> Calculated from heat of combustion per gram.

<sup>c</sup> Protein assumed from previous analysis; heat of combustion determined.

<sup>d</sup> Estimated.

### DIETARY STUDIES AT BAYVIEW ASYLUM.

The data for this series of studies were collected by Mr. H. A. Pratt, at Bayview Asylum, Baltimore, Md., in May, 1905, the investigation being carried on with the cooperation of the board of charities, to find the existing food consumption, the character of the food supply, and the methods of cooking and serving food, with a view to making suggestions for improvements if necessary and possible, and to obtain data regarding the food consumption and requirements of elderly men and women, the population of Bayview being largely composed of such persons. This institution, which is pleasantly located in the eastern suburbs of Baltimore, overlooking Patapsco Bay, is the almshouse of Baltimore, and is under the direction of the city board of charities. To it are admitted those of the city poor who are unable to support themselves and have no one on whom they can depend, and also poor people who are unfit to care for themselves by reason of physical or mental disability. While not primarily an insane asylum, Bayview, at the time of the study, admitted the pauper insane of the city and cared for them in a separate ward. The State has since taken over such patients. The report of the city board of charities for 1904 says:

There has been a difficulty in securing a recognition of the proper function of Bayview as an infirmary and hospital. It is neither a reformatory nor a penal institution. It is intended for persons who are sick, infirm, or aged, who are unable to support themselves or to find others to support them. It is not intended for the able-bodied or for persons in need of reformation.

The average population of Bayview in 1904 was about 1,348, of whom 625 were insane and hospital patients, and the majority of the remainder (723) aged men and women. The population is, however, very variable, being larger in winter than in summer, since there are always, as in all cities, a certain number who seek public shelter during the cold winter. It is also true that a considerable number of the inmates work on farms during the summer and return after the farming season. At the time of the study the inmates were very largely persons ranging from middle life to old age, the number of men and women being about equal, and there were many infirm and maimed or crippled persons among the number. The large number of hospital patients consisted not only of the persons who became ill while inmates of the institution, but also of pauper patients transferred from the city hospitals.

The inmates did nearly all the work of the institution, both indoors and on the institution farm. This is over 200 acres in extent and yields a large part of the vegetables consumed by the inmates and employees. A number of those who did regular work received wages for their services. No work was carried on at Bayview except that

incident to the operation of the institution—that is, nothing was manufactured for sale.

The institution life of the inmates was very regular. They rose early in the morning, the rising bell ringing at about 5.30 a. m. They also retired early, the great majority being in bed before 9 o'clock, the official time for "lights out." The meals were served at regular hours, although the hours in each division of the institution were not precisely the same, and the women ate breakfast somewhat later than the men. On Sundays supper was served earlier than on the other days of the week. Religious services were conducted daily by different church organizations, and occasional entertainments were provided by various charitable organizations in the city for the amusement of the patients.

All matters pertaining to the management of Bayview have received very careful attention from supervisors of city charities and from the institution officials. Several years before the studies were made the dietary question was carefully considered by one of the members of the board who had had a great deal of experience in the study of nutrition problems. As a result the rations now supplied were determined upon because they were believed to meet the requirements of the subjects and to conform to the commonly accepted dietary standards, while at the same time they were reasonably varied and palatable and came within the sum available for food expenditures per person per day. The dietary as thus arranged has proved fairly satisfactory, as was shown by the fact that the inmates retained their accustomed health and strength to a noticeable degree, considering the large proportion of aged and infirm.

The buildings of the institution were well adapted to their several purposes, though at the time of the studies somewhat overcrowded. They were particularly noticeable for the neatness and cleanliness everywhere evident. The main building, which was the one in which the dietary studies were made, was of brick, four stories high, one wing being used for male and the other for female inmates. Each section had its hospital and its sun parlors in addition to dormitories, dining room, lavatories, etc. The official force had their living rooms and dining rooms in the center of the main building, and there were also one or two large public rooms.

A part of the food supplied to the divisions studied was cooked in the "diet kitchen," but the greater portion in the so-called "county kitchen." The "diet kitchen" was situated in a wing in the rear of the building and was especially equipped for its purpose. From it was served a part of the menu for the regular inmates and also for the hospital patients of the institution. The "county kitchen," in the basement of the main building, was the principal kitchen of the institution, and most of the food for the inmates was cooked there.

It was of good size, clean, and orderly, and seemed to answer its purpose very well. All the workers in this kitchen, including the head cook, were inmates. The bakery of the institution, where all the bread used is baked, was also well equipped. It was situated in the basement of the main building, directly back of the "county kitchen."

#### STAPLE FOODS AND METHODS OF SERVING.

Some observations in regard to the staple foods of the institution and the way they are served are of interest, preliminary to a consideration of the dietary studies.

In general, it should be said that the officers of the institution made a special effort to see that all the provisions purchased were of the very best quality that could be secured with the funds at their disposal.

All foods which were purchased were bought under contract if the amount exceeded 500 pounds. The number of cooked articles served to the inmates was comparatively small, bread, coffee, and soup being the three staple articles of diet. For two or three weeks in the spring and during the time of these studies, fish and coffee were served in place of the soup on Fridays. Otherwise, the soup, which should more properly be called a stew, was cooked and served every day of the week except Sunday. As a rule this soup was made of beef and vegetables, though mutton was used in place of beef one day in each week, either Friday or Saturday. Two methods of making the soup were followed. On Mondays and Thursdays the meat was boiled, cut from the bones, and after being apportioned in lots suitable for the different dining rooms, was placed in kettles, where it was kept hot until served, becoming in the meantime more or less brown and savory, so that it resembled a pot roast. A gravy was provided for the meat in some but not in all of the dining rooms. Into the stock from the boiled meat were put the vegetables which always made up a part of the dinner—potatoes, carrots, onions, etc. These were then boiled and the soup, or broth, i. e., stock plus vegetables, was apportioned to the several dining rooms. The meat was served on plates, a ration to a person, while the broth was served in tin cups. This entire dinner was called "soup" at the institution, and is so called throughout this report, though the meat was served entirely separate from the broth.

On other days the soup was made in the usual way, that is, the meat was cooked, then boned, and replaced in the kettle with the potatoes and other vegetables. To prevent its breaking up too much the cooked meat was not added until the vegetables were partly done. A small quantity of flour was added to the soup to thicken it slightly, and salt and pepper were of course used. This soup was very palatable, resembling stew rather than soup, and seemed on the whole to be

well liked. In this case the meat and broth were served together. In general, the thicker the soup, that is, the more meat and vegetables it had in it, the better it was relished.

The beef which the institution used was mostly the portions known as "sides and rattlers," the better cuts of the former being reserved for the officers and employees. It was purchased from Baltimore dealers. While economy demanded that the meat be cheap, it appeared to be of good quality. It was always subjected to a careful inspection by the steward before being received. Fresh roast pork, raised at the asylum, was served on Sundays during the winter season in place of the smoked pork shoulder.

The use of fish was rather restricted at Bayview. During part of the year the women inmates who worked received salt herring for breakfast one morning each week. In general, fresh fish was not supplied, but in the spring, when fresh herring were in season, they were served baked for the Friday dinner, and formed a palatable dish. When this change was made in the menu mutton soup was served on Saturday instead of Friday, as at other seasons.

The bread baked at the institution was excellent in quality, an experienced baker being in charge of this department. The bread served to the inmates was made of a mixed spring and winter wheat flour. This yielded a loaf which, though not absolutely white in color, was light, tender, and of excellent flavor, with a crust nicely browned but not too thick. The bread was practically uniform in quality. These characteristics, always desirable, are essential when, as at Bayview and many other institutions, bread forms the basis of the diet.

During the green-vegetable season two kinds were served on Sundays. Throughout the summer corn, peas, etc., were added to the soup when they could be obtained from the farm. Radishes and onion tops were served to the various dining rooms in season, generally for supper, and were much relished. Vinegar was allowed the inmates on days when bacon, cabbage, or greens were served. Salt was always placed on the tables, but pepper was generally added in the kitchen to the articles which required it. So far as could be ascertained, the inmates received no desserts of any sort except on certain holidays, when a complete change was made in the dinner menu.

The women inmates drank a good deal of tea, but on the whole coffee was the beverage of the institution. The latter was served twice a day, namely, at breakfast and at supper, and was made from a combination of Rio coffee and roasted rye, a mixture not uncommon in many homes in the locality. Sugar and milk were not placed on the tables, but were added to the coffee when it was made. This method, while it appeared to be the only one practicable, had the disadvantage of not suiting the individual preferences regarding the

quantity of sugar and milk. It was learned that an attempt was once made to put sugar on the table and let the men help themselves, but this was found impracticable. It would seem that in such an institution arrangements might be made whereby one person at each table might have charge of the milk and sugar and give each one at the table the amounts which suited his taste. Otherwise, the coffee seemed to be fairly satisfactory. The amount of milk used in it was greater or less according to the season, as the institution depends upon its own herd of cows for its milk supply. At the time of these studies (spring, 1905) about 8 gallons of milk were used in making up approximately 150 gallons of coffee. The amount of sugar used for this quantity was about 38 pounds.

Bread was the only article of food supplied in absolutely unlimited quantities to every person. Nevertheless, the aim was to provide enough of other foods so that there should be plenty for second or even third helpings for all who desired them.

In apportioning the soup and coffee to the different departments, the cook served what he considered sufficient amounts, measuring the quantities with his dippers, which he knew held a certain number of rations. The quantities served were in accordance with the number of people in each department, with an allowance, based on experience, for extra helpings. Similarly, the meat served on Mondays and Thursdays was cut up into rations and these rations counted out and apportioned according to the number of persons, some allowance being made for extra helpings. The cook's judgment in this matter was very good. There were very seldom calls at the kitchen for extra supplies, and, on the other hand, the amounts left over were very small.

The diet throughout the summer was varied by the use of different vegetables in their season. One practice at Bayview, namely, the method of distributing radishes, green onions, etc., was interesting, inasmuch as it is not customary, or at least it was not followed at other institutions in which dietary studies have been made under the auspices of this Office. If there were not enough vegetables at any one time to supply the whole institution, the supply first at hand was given, say, to the women's dining room, then the next lot to the men's dining room, and so on in rotation. In some institutions an article, even if it grows in the institution garden, is not commonly used unless there is enough to serve the whole institution at the same time.

#### MENUS FOR THE DIFFERENT WARDS.

The four dietary studies made at Bayview included by no means all the different classes of inmates. It is of interest, therefore, to give some data regarding the general menus, to show both the kinds of food used and the variations in the rations of different wards of the institution. These menus were of necessity very simple, and since

they were made at a time of the year when there was little variety in the vegetables available, indicate a simpler diet than was really served, taking the year through. It should also be remembered that at Bayview, as in most institutions, the Sunday and holiday meals varied from those of other days. On Sunday soup was not served, but meat (generally salt smoked pork or shoulder) and vegetables were provided, and on regular holidays, special dinners. Thus on Thanksgiving turkeys are served, and on Christmas, New Year's, and Fourth of July, special menus are provided.

A menu, selected as a fair sample of those served in the insane department, follows:

#### SAMPLE MENU OF INSANE DEPARTMENT.

Breakfast: Bread, coffee.

Dinner: Beef soup <sup>a</sup> with vegetables, bread, rice.

Supper: Bread, stewed fruit, coffee.

A sample menu for the hospital ward follows:

#### SAMPLE MENU OF HOSPITAL WARD.

Breakfast: Oatmeal, milk, bread, butter, eggs, tea, and coffee.

Dinner: Chicken soup, beefsteak, bread, tea.

Supper: Bread, butter, crackers, milk, tea, and coffee.

The menus for the phthisical ward and for the chronic patients were of the same general character.

A sample menu for the infirmary ward or "general diet" follows:

#### SAMPLE MENU FOR INFIRMARY (OR GENERAL DIET).

Breakfast: Oatmeal, milk, bread, butter, eggs, tea, and coffee.

Dinner: Beef soup with vegetables, bread.

Supper: Bread, coffee.

The character of meals served the working women is shown by the following sample menu:

#### SAMPLE MENU FOR WORKING WOMEN.

Breakfast: Oatmeal, milk, Hamburg steak, bread, butter, tea, and coffee.

Dinner: Bacon, beef soup with vegetables, rice, milk, bread.

Supper: Bread, butter, tea, and coffee.

The farm and stable helpers received the infirmary diet, together with a sort of meat and vegetable stew, called "hash," for breakfast each morning, cold beef for supper each evening, and molasses Tuesday evening at supper.

According to these menus the diet of the department for the insane appears to have been more varied than that of any other departments of Bayview excepting the hospital wards. Many of the inmates were

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<sup>a</sup> See p. 19.

physically vigorous, and the Bayview officials evidently shared the belief commonly held that the insane need a fairly generous diet. The diet in the insane ward did not differ very much from hospital diets of public insane hospitals, as reported in previous studies made under the auspices of this Department<sup>a</sup> and similar work.<sup>b</sup> Rice and oatmeal were used extensively, both being well cooked. In the hospital ward the diet was naturally quite different from that in either the insane wards or the wards for regular inmates, being fitted to the needs of the individual patients. Eggs and milk were, of course, much used there.

There is no question that the diet supplied the regular population (with the exception of the hospital wards) was less varied than that of many hospitals for the insane. It is interesting to note in this connection that when inmates were first received they were, as a rule, satisfied with the food, but after a time they did not relish it so much. This was very likely due, in large measure, to the monotony of the diet.

Apparently the menu as a whole was as good as was possible with the amount of money available; and if the institution authorities are to provide a more varied diet more money will be required. If more money could be allowed for the purpose the diet could be easily and materially improved. There are a number of inexpensive dishes which are commonly used in insane hospitals which could be suggested for use here and which, introduced at least one day in a month, would make a comparatively small increase in the cost per year to the asylum. Such changes are, for example, the addition of baked beans to the regular supper menu once each month. Ginger cake might also be used for supper once a month, along with the regular bread and coffee, and would give a pleasing variety to the diet, particularly as nothing in the nature of a dessert is served except on holidays. Baked chopped hash would be a new and inexpensive dish that might readily be supplied. It would seem, too, that potatoes should be served with fish, as that accords with the custom in this country. While the bread served is very good, the occasional use of rolls or biscuits would vary the diet and make very little difference in cost. Frankfort sausages would also give a pleasing variety. Macaroni, prepared with tomatoes or cheese, would make a very palatable and nutritious dish at a very small cost. It is altogether probable that some such small additions to the menu would be of value as a source of greater contentment, even though they were not absolutely needed for nourishment.

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<sup>a</sup> U. S. Dept. Agr., Office Expt. Stas. Bul. 150.

<sup>b</sup> N. Y. State Com. Lunacy Ann. Rpt., 11 (1898-9); 12 (1899-1900); 13 (1900-1).

**METHODS OF MAKING THE DIETARY STUDIES.**

The weights of foods served, returned, and wasted during these studies were recorded in the usual way; the methods of cooking were noted; the composition of the different foods was determined as described on page 15; and the number of persons served in the dining rooms under consideration was noted for each meal. From these data has been deduced the nutritive value of food served, eaten, and wasted per man or per woman per day, as shown in the tables beyond. Observations of general conditions were also made as an aid to interpreting the data.

One variation from the usual custom has been made in presenting the results of the investigation. It has been usual to record the amounts of nutrients and energy per man per day. In these studies, however, only the figures for protein and energy are given, these constituting the essential data for considering the nutritive value of the ration and related questions. The tables, therefore, do not show the relation of fats and carbohydrates to the diet. While such data might be interesting, they are not essential, since in the ordinary mixed diet it may be safely assumed that fats and carbohydrates will appear in reasonable proportions, and, furthermore, on theoretical grounds, it is immaterial, at least within limits not exceeded in these diets, which of these classes of foods supplies the energy, provided the total quantity is sufficient.

**DIETARY STUDIES NOS. 682 AND 683, MEN'S DINING ROOM, REGULAR PATIENTS AND STABLE HANDS AND CHRONIC AND SPECIAL DIET PATIENTS.**

Dietary studies Nos. 682 and 683 were carried on simultaneously in the men's dining room, which is the largest in the institution and in which several classes of persons are served. The total number served at the time the studies were made included 16 farm and stable helpers, 135 regular inmates, 82 chronic patients, and 24 men on special diet. In the winter the number served in the dining room is considerably larger. Study No. 682 included the regular patients and the stable hands and No. 683 the chronic and special diet patients.

During the week covered by these studies the chronic population included in study No. 683 did not vary from day to day. There was a very marked decrease, however, in the number supplied with the regular diet and included in study No. 682, the exact number for each day of the week covered by the study being as follows: Monday, 144; Tuesday, 143; Wednesday, 140; Thursday, 136; Friday, 132; Saturday, 128, and Sunday, 127.

The majority of inmates in this dining room were classed as workers, though the amount of work they did was, of course, very variable.

It has been stated above that the population of Bayview was composed almost entirely of men and women ranging from middle life to old age. In this dining room the so-called chronic patients were almost all elderly and decrepit, while the large majority of the regular inmates were men in middle life or older. The officer in charge of this dining room (himself an inmate of the institution) gave it as his opinion that the number of men under 50 years of age constituted a very small fraction of the total number.

The dining room was well cared for and clean. The food was served on bare, unpolished wooden tables, which were frequently washed and scrubbed with great care. The menu for the regular, chronic, and special diet patients was principally the same, but the chronic patients were supplied, in addition, with some articles which the regular inmates did not receive, and the special-diet patients had extra articles on order of the physician in charge. The farm and stable helpers had somewhat different food from the other inmates of this dining room, being allowed meat three times a day and potatoes with dinner on several days of the week. The meat and potatoes were frequently served together in a dish called "hash," though it was really a beef stew. Soup and coffee were served in tin cups, crockery plates being provided for other food. The ration system was followed entirely in this dining room except in the case of bread, that is, each man's share of the different kinds of food was served to him from the large lots sent from the kitchen and put at his place at the table. Bread was sliced and placed in square tin pans, three or four to a table, so that each man might help himself.

Meals were served as follows: Breakfast at 6 a. m., dinner at 12 m., and supper at 5.50 p. m. In the winter season there was not room for all the men to eat at the same time; the chronic patients were therefore served about twenty minutes earlier than the others and finished in time to let all the regular patients sit down together. In general no attempt was made to keep separate the amount of bread served to each person or the amounts of individual waste. The waste bread from the chronic patients was, however, kept separate for the different meals of one day, and the amount weighed. This, it is believed, gave a very fair idea of the average waste of bread from this department, as there appeared to be little variation in the amount from day to day. The results of the study with regular patients and stable hands are summarized in the table which follows, and show the amounts of protein and energy in food eaten and wasted for seven consecutive days of three meals each, the results being given separately for each day of the week. This method of tabulating the data gives an opportunity to observe the variation in food consumption on different days.

*Amounts of protein and energy in food eaten and wasted per man per day,  
dietary study No. 682.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
<b>SUPPER, MAY 7, TO DINNER, MAY 8.</b>				
Animal food:				
Beef, roasted (18) <sup>a</sup> .	3	21		
Beef, boiled (1)	41	381		
Milk (33)	2	31		
Total animal food	46	433		
Vegetable food:				
Bread (4)	55	1,273	4	103
Sugar (46)		97		
Potatoes (baked) (64) <sup>a</sup>	1	33		
Sauce, evaporated apples (13)	1	222		12
Total vegetable food	57	1,625	4	115
Miscellaneous food:				
Soup (6)	17	522	1	20
Hash (80) <sup>b</sup>	5	72		6
Broth from soup (11)			1	8
Total miscellaneous food	22	594	2	34
Total food for 3 meals	125	2,652	6	149
<b>SUPPER, MAY 8, TO DINNER, MAY 9.</b>				
Animal food:				
Pork, shoulder, boiled (23)	23	424		
Milk (33)	2	32		
Total animal food	25	456		
Vegetable food:				
Bread (4)	66	1,527	3	74
Sugar (46)		100		
Total vegetable food	66	1,627	3	74
Miscellaneous food:				
Soup (15)	36	561		4
Hash (80) <sup>b</sup>	6	91		2
Broth from soup (11)			1	7
Total miscellaneous food	42	652	1	13
Total food for 3 meals	133	2,735	4	87
<b>SUPPER, MAY 9, TO DINNER, MAY 10.</b>				
Animal food:				
Beef, roasted (19) <sup>a</sup>	4	55		
Pork, shoulder, boiled (23)	22	406		
Milk (33)	2	33		
Total animal food	28	494		
Vegetable food:				
Bread (4)	64	1,481	3	79
Sugar (46)		102		
Radishes (68)	1	17		
Total vegetable food	65	1,600	3	79
Miscellaneous food:				
Soup (15)	39	608		
Hash (80) <sup>b</sup>	5	80		
Total miscellaneous food	44	688		
Total food for 3 meals	137	2,782	3	79
<b>SUPPER, MAY 10, TO DINNER, MAY 11.</b>				
Animal food:				
Beef, boiled (1)	41	377		
Beef, roasted (19) <sup>a</sup>	9	117		
Pork, shoulder, boiled (23)	19	345		
Milk (33)	1	34		
Total animal food	70	873		

<sup>a</sup> Served only to farm and stable helpers.

<sup>b</sup> This was a thick stew of potatoes and meat. It was served only to farm and stable helpers.

*Amounts of protein and energy in food eaten and wasted per man per day,  
dietary study No. 682—Continued.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
<b>SUPPER, MAY 10, TO DINNER, MAY 11—continued.</b>				
Vegetable food:				
Bread (4).....	67	1,544	3	72
Sugar (46).....		96		
Potatoes, boiled (65) <sup>a</sup> .....	1	29		
Total vegetable food.....	68	1,669	3	72
Miscellaneous food:				
Soup (6).....	19	514		
Hash (80) <sup>b</sup> .....	6	87		
Broth from soup (11).....			1	6
Total miscellaneous food.....	25	601	1	6
Total food for 3 meals.....	163	3,143	4	78
<b>SUPPER, MAY 11, TO DINNER, MAY 12.</b>				
Animal food:				
Pork, shoulder, boiled (23).....	19	359		
Herring, baked (28).....	68	969		
Milk (33).....	2	40		
Total animal food.....	89	1,368		
Vegetable food:				
Bread (4).....	74	1,707	3	70
Sugar (46).....		155		
Total vegetable food.....	74	1,862	3	70
Miscellaneous food: Hash (80) <sup>b</sup> .....	6	87		5
Total food for 3 meals.....	169	3,317	3	75
<b>SUPPER, MAY 12, TO DINNER, MAY 13.</b>				
Animal food:				
Butter (31) <sup>a</sup> .....		34		
Milk (33).....	2	54		
Total animal food.....	2	88		
Vegetable food:				
Bread (4).....	69	1,585	4	92
Sugar (46).....		101		
Radishes (68).....	1	28		
Total vegetable food.....	70	1,714	4	92
Miscellaneous food:				
Soup (7).....	51	523		
Hash (80) <sup>b</sup> .....	6	87		
Total miscellaneous food.....	57	610		
Total food for 3 meals.....	129	2,412	4	92
<b>SUPPER, MAY 13, TO DINNER, MAY 14.</b>				
Animal food:				
Beef, roasted (19) <sup>a</sup> .....	4	54		
Pork, shoulder, boiled (23).....	52	963		
Milk (33).....	2	34		
Total animal food.....	58	1,051		
Vegetable food:				
Bread (4).....	70	1,611	5	119
Sugar (46).....		103		
Cabbage sprouts, boiled (5).....	12	282		
Potatoes, boiled (66).....	4	139		
Total vegetable food.....	86	2,135	5	119
Miscellaneous food: Hash (80) <sup>b</sup> .....	5	80		
Total food for 3 meals.....	149	3,266	5	119
Average per day for entire study.....	144	2,901	4	97

<sup>a</sup> Served only to farm and stable helpers.

<sup>b</sup> This was a thick stew of potatoes and meat. It was served only to farm and stable helpers.

The data given in the above table for dietary No. 682 show very clearly that there is a decided difference in the amount of nourishment received from day to day by the average subject, the quantities for individual days ranging from 125 grams to 169 grams of protein and from 2,412 to 3,317 calories of energy. The average for the seven days was 144 grams protein and 2,901 calories of energy per day. These figures are rather noticeable, since they show a somewhat narrower nutritive ratio than has usually been found in the dietary studies made under the auspices of the Office of Experiment Stations,<sup>a</sup> i. e., the proportion of protein to the energy is quite large. As is discussed in some detail elsewhere (p. 40), the subjects of this study were apparently well nourished. It seemed to the observer that in these studies the amounts of food consumed by different individuals varied greatly. Some inmates really consumed very little, while others were hearty eaters. This means that the individual consumption varied more from the average than in studies previously reported.

The amount of waste in study No. 682 was nearly uniform for each day of the study, and the daily average, 4 grams protein and 97 calories of energy—only 3 per cent of the total amounts supplied—is remarkably small not only for institution but even for family dietaries. The reason for such a small amount of wasted food is discussed on page 36. One point which should be noted in this and the following dietary studies is that the soup wasted was in many cases wholly or in part of different composition from that consumed, because the inmates ate nearly all the solid matter of the soup and left the broth. When both soup and soup broth remained the total waste was weighed and the proportion of broth estimated. A sample of this waste broth was analyzed and its percentage composition used for computing the nutritive value of all the waste broths. While this method is not strictly accurate, it is the only one which seemed practicable and is certainly much more accurate than to assume that the waste had the higher composition of the thick soup served. These waste portions of the soup had but little nutritive value, being largely fluid.

The general conditions under which dietary study No. 683 with chronic patients and those on a special diet, served in the men's dining room, was made, were spoken of in connection with dietary study No. 682, the two studies, as has been said, being carried on at the same time. The results of the study are summarized in the table which follows.

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<sup>a</sup> See U. S. Dept. Agr. Office Expt. Stas. Cir. 89.

*Amounts of protein and energy in food eaten and wasted per man per day,  
dietary study No. 683.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
<b>SUPPER, MAY 7, TO DINNER, MAY 8.</b>				
Animal food:				
Beef, boiled, with gravy (17).....	41	553		
Eggs, boiled (30).....	2	24		
Butter (31).....		158		
Milk (33).....	9	188		
Total animal food.....	52	923		
Vegetable food:				
Oatmeal, boiled (2).....	5	139		
Bread (4).....	24	562	2	38
Sugar (46).....		98		
Total vegetable food.....	29	799	2	38
Miscellaneous food:				
Soup (6).....	18	521	1	18
Broth, from soup (11).....				5
Total miscellaneous food <i>a</i> .....	18	521	1	23
Total food for 3 meals.....	99	2,243	3	61
<b>SUPPER, MAY 8, TO DINNER, MAY 9.</b>				
Animal food:				
Eggs (30).....	2	25		
Butter (31).....		158		
Milk (33).....	9	185		
Total animal food.....	11	368		
Vegetable food:				
Oatmeal, boiled (2).....	4	130		
Rice, boiled (3).....	3	168		
Bread (4).....	26	587	2	38
Sugar (46).....		100		
Total vegetable food.....	33	985	2	38
Miscellaneous food:				
Soup (15).....	35	556	1	10
Broth, from soup (11).....				6
Total miscellaneous food <i>b</i> .....	35	556	1	16
Total food for 3 meals.....	79	1,909	3	54
<b>SUPPER, MAY 9, TO DINNER, MAY 10.</b>				
Animal food:				
Eggs (30).....	2	25		
Butter (31).....		158		
Milk (33).....	10	198		
Total animal food.....	12	381		
Vegetable food:				
Oatmeal, boiled (2).....	5	139		
Sugar (46).....		100		
Bread (4).....	25	587	2	38
Radishes (68).....	1	18		
Sauce from evaporated apples (14).....	1	140		
Total vegetable food.....	32	984	2	38
Miscellaneous food: Soup (15).....	31	497		
Total food for 3 meals <i>c</i> .....	75	1,862	2	38
<b>SUPPER, MAY 10, TO DINNER, MAY 11.</b>				
Animal food:				
Beef, boiled, with gravy (17).....	42	554		
Eggs (30).....	2	25		
Butter (31).....		158		
Milk (33).....	9	197		
Total animal food.....	53	934		

*a* Of this, 7 grams of protein and 150 calories of energy were served to special-diet patients only.

*b* Of this, 8 grams of protein and 156 calories of energy were served to special-diet patients only.

*c* Of this, 8 grams of protein and 161 calories of energy were served to special-diet patients only.

*Amounts of protein and energy in food eaten and wasted per man per day,  
dietary study No. 683—Continued.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
<b>SUPPER, MAY 10, TO DINNER, MAY 11—continued.</b>				
Vegetable food:				
Oatmeal, boiled (2).....	5	141		
Bread (4).....	25	584	1	41
Sugar (46).....		98		
Total vegetable food.....	30	823	1	41
Miscellaneous food:				
Soup (15).....	34	532		
Broth from soup (11).....			1	8
Total miscellaneous food.....	34	532	1	8
Total food for 3 meals <i>a</i> .....	117	2,289	2	49
<b>SUPPER, MAY 11, TO DINNER, MAY 12.</b>				
Animal food:				
Herring, baked (28).....	70	939		
Eggs (30).....	2	25		
Milk (33).....	10	198		
Butter (31).....		158		
Total animal food.....	82	1,320		
Vegetable food:				
Oatmeal, boiled (2).....	5	139		
Rice, boiled (3).....	3	174		
Bread (4).....	25	587	2	37
Sugar (46).....		155		
Total vegetable food.....	33	1,055	2	37
Total food for 3 meals <i>b</i> .....	115	2,375	2	37
<b>SUPPER, MAY 12 TO DINNER, MAY 13.</b>				
Animal food:				
Eggs (30).....	2	25		
Butter (31).....		158		
Milk (33).....	10	209		
Total animal food.....	12	392		
Vegetable food:				
Oatmeal, boiled (2).....	5	138		
Bread (4).....	25	587	2	38
Sugar (46).....		100		
Radishes (68).....	1	28		
Sauce from evaporated apples (14).....	1	143		
Total vegetable food.....	32	996	2	38
Miscellaneous food: Soup (7).....		383		
Total food for 3 meals <i>c</i> .....	82	1,771	2	38
<b>SUPPER, MAY 13, TO DINNER, MAY 14.</b>				
Animal food:				
Pork, shoulder, boiled (23).....	27	485		
Eggs (30).....	2	25		
Butter (31).....		158		
Milk (33).....	7	150		
Total animal food.....	36	818		
Vegetable food:				
Oatmeal, boiled (2).....	4	131		
Bread (4).....	25	587	2	37
Sugar (46).....		103		
Cabbage sprouts, boiled (5).....	17	382		
Potatoes, boiled (65).....	2	61		
Total vegetable food.....	48	1,264	2	37
Total food for 3 meals <i>d</i> .....	84	2,082	2	37
Average per day for entire study <i>e</i> .....	93	2,076	2	45

*a* Of this, 7 grams of protein and 159 calories of energy were served to special-diet patients only.

*b* Of this, 8 grams of protein and 167 calories of energy were served to special-diet patients only.

*c* Of this, 8 grams of protein and 172 calories of energy were served to special-diet patients only.

*d* Of this, 5 grams of protein and 106 calories of energy were served to special-diet patients only.

*e* Of this, 7 grams of protein and 153 calories of energy were served to special-diet patients only.

The figures recorded in the table for food eaten and wasted by the chronic inmates present a striking contrast to those in the table on page 27, though all these subjects received their meals in the same dining room. The amount of protein in the ration of the chronic and special diet patients varied from 75 to 117 grams, and the energy from 1,771 to 2,375 calories per man per day, the average for the seven days covered by the study being 93 grams protein and 2,076 calories energy. These amounts are very much smaller than was the case with the regular patients in dietary study No. 682, the energy value being especially low.

The amount of waste in this study, as in the preceding, was extremely small, the average for the week being but 2 grams protein and 45 calories energy per day, or 2 per cent of the total amount of each supplied. These figures, like those in the preceding study, are very small and will be discussed beyond (see p. 35).

#### **DIETARY STUDY NO. 684, WOMEN'S DINING ROOM.**

Dietary study No. 684 was made in the women's dining room with 110 women, on an average, and 3 men who also had their meals there. Of the total number of subjects only about 55 were classed as workers, though nearly all did more or less work. A large number of the women were elderly; in fact, the majority had passed middle life and some were very old. The ration system (see p. 25) was followed in this as in the men's dining room. Part of the food served was cooked in the "county kitchen" and part in the "diet kitchen," while some of the extra allowance of meat for the workers was supplied from the officers' kitchen. It was not found practicable to obtain the weights of the food of the working women as distinguished from that of the others, so the weighings were made for the whole group. It is believed, however, that this does not introduce any great error in the final results, as certainly over half of the group were workers and the amount of extra food did not constitute a very large proportion of the total diet.

The dining room was similar in all essentials to that in the men's ward, as was also the service.

The data showing the amount of protein and energy in eaten and wasted food in the women's dining room during the week covered by the study are shown in the following table, the quantities being expressed on the basis "per woman per day." In computing the results the food of the 3 men was considered equivalent to that of 4 women.

*Amounts of protein and energy in food eaten and wasted per woman per day,  
dietary study No. 684.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
SUPPER, MAY 14, TO DINNER, MAY 15.				
Animal food:				
Beef, boiled (1).....	28	257		
Eggs (30).....	2	19		
Butter (31).....		112		
Milk (33).....	12	207		
Total animal food.....	42	655		
Vegetable food:				
Oatmeal, boiled (2).....	2	70		
Bread (4).....	33	745	6	152
Sugar (46).....		131		
Total vegetable food.....	35	946	6	152
Miscellaneous food:				
Hash (80).....	8	128		
Gravy (12).....	2	58		
Soup (8).....	4	143		
Broth from soup (11).....			1	12
Total miscellaneous food.....	14	329	1	12
Total food for 3 meals <sup>a</sup> .....	91	1,930	7	164
SUPPER, MAY 15, TO DINNER, MAY 16.				
Animal food:				
Hamburg steak (20).....	7	57		
Eggs (30).....	2	19		
Butter (31).....		109		
Milk (33).....	13	286		
Total animal food.....	22	471		
Vegetable food:				
Oatmeal, boiled (2).....	2	64		4
Rice, boiled (3).....		31	1	25
Bread (4).....	32	734	6	138
Sugar (46).....		127		
Radishes (68).....	2	39		
Total vegetable food.....	36	995	7	167
Miscellaneous food:				
Gravy (12).....		18		
Soup (9).....	22	319		
Broth from soup (11).....			1	15
Total miscellaneous food.....	22	337	1	15
Total food for 3 meals <sup>b</sup> .....	80	1,803	8	182
SUPPER, MAY 16, TO DINNER, MAY 17.				
Animal food:				
Pork, shoulder, boiled (23).....	11	194		
Eggs (30).....	2	18		
Butter (31).....		108		
Milk (33).....	12	250		
Total animal food.....	25	579		
Vegetable food:				
Oatmeal, boiled (2).....	2	62		7
Bread (4).....	34	775	4	89
Sugar (46).....		126		
Total vegetable food.....	36	963	4	96
Miscellaneous food:				
Soup (15).....	14	233		
Broth from soup (11).....			1	13
Total miscellaneous food.....	14	233	1	13
Total food for 3 meals <sup>b</sup> .....	75	1,775	5	109

<sup>a</sup> Of this, 4 grams of protein and 55 calories of energy were served to special-diet patients only.

<sup>b</sup> Of this, 4 grams of protein and 57 calories of energy were served to special-diet patients only.

*Amounts of protein and energy in food eaten and wasted per woman per day,  
dietary study No. 684—Continued.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
<b>SUPPER, MAY 17, TO DINNER, MAY 18.</b>				
Animal food:				
Beef, boiled, with gravy (17).....	48	643		
Pork, shoulder, boiled (23).....	8	148		
Eggs (30).....	2	18		
Butter (31).....		108		
Milk (33).....	12	255		
Total animal food.....	70	1,172		
Vegetable food:				
Oatmeal, boiled (2).....	2	61		
Bread (4).....	34	787	3	78
Sugar (46).....		126		
Onion tops, spring onions (59).....	1	57		
Sauce from evaporated apples (14).....	1	60		
Total vegetable food.....	38	1,091	3	84
Miscellaneous food:				
Soup (15).....	15	241		
Broth from soup (11).....			1	16
Total miscellaneous food.....	15	241	1	16
Total food for 3 meals <i>a</i> .....	123	2,504	4	100
<b>SUPPER, MAY 18, TO DINNER, MAY 19.</b>				
Animal food:				
Herring, baked (28).....	11	164		
Eggs (30).....	2	18		
Butter (31).....		108		
Milk (33).....	13	260		
Total animal food.....	26	550		
Vegetable food:				
Oatmeal, boiled (2).....	2	68		
Rice, boiled (3).....	1	38		
Bread (4).....	32	750	5	114
Sugar (46).....		126		
Total vegetable food.....	35	982	5	114
Miscellaneous food:				
Soup (15).....	16	253		
Broth from soup (11).....			1	17
Total miscellaneous food.....	16	253	1	17
Total food for 3 meals <i>a</i> .....	77	1,785	6	131
<b>SUPPER, MAY 19, TO DINNER, MAY 20.</b>				
Animal food:				
Eggs (30).....	2	19		
Butter (31).....		108		
Milk (33).....	12	250		
Total animal food.....	14	377		
Vegetable food:				
Oatmeal, boiled (2).....	2	68		
Bread (4).....	34	775	4	89
Sugar (46).....		126		
Radishes (68).....	2	40		
Total vegetable food.....	38	1,009	4	89
Miscellaneous food:				
Soup (15).....	14	233		
Hash (80).....	8	124		
Broth from soup (11).....			1	14
Total miscellaneous food.....	22	357	1	14
Total food for 3 meals <i>b</i> .....	74	1,743	5	103

*a* Of this, 4 grams of protein and 56 calories of energy were served to special-diet patients only.

*b* Of this, 4 grams of protein and 55 calories of energy were served to special-diet patients only.

*Amounts of protein and energy in food eaten and wasted per woman per day, dietary study No. 684—Continued.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
SUPPER, MAY 20, TO DINNER, MAY 21.				
Animal food:				
Pork, shoulder, boiled (23).....	16	293		
Eggs (30).....	1	19		
Butter (31).....		147		
Milk (33).....	13	265		
Total animal food.....	30	724		
Vegetable food:				
Oatmeal, boiled (2).....	2	53		
Bread (4).....	34	782	4	98
Cabbage sprouts (5).....	8	178	2	54
Sugar (46).....		128		
Sauce from evaporated apples (14).....		61		
Total vegetable food.....	44	1,202	6	152
Total food for 3 meals <sup>a</sup> .....	74	1,926	6	152
Average per day for entire study <sup>a</sup> .....	85	1,924	6	134

<sup>a</sup> Of this, 4 grams of protein and 57 calories of energy were served to special-diet patients only.

The data given in the table above show that the variations in the amounts of food consumed on different days of the week were considerable, as was the case in the two preceding studies. The average amounts eaten per woman per day, 85 grams protein and 1,924 calories of energy, are equivalent to 106 grams protein and 2,405 calories of energy when calculated on the basis per man per day (the daily food requirement of a woman being taken as 0.8 that of a man). That this ration furnished sufficient protein there can be but little question. The amount of energy furnished is, however, not proportionately high. Whether or not the amount was sufficient is discussed later (p. 40).

The 6 grams of protein and 134 calories of energy in the waste represent about 7 per cent of the total food served. This amount, though relatively larger than that noted in the other studies at Bayview, was small as compared with that in other institutions studied.

#### DIETARY STUDY NO. 685, MEN'S RECEIVING WARD.

Study No. 685 was made with 82 men in the men's receiving ward, which is located in the half basement of the main building. It is in this ward that the men are placed on coming into the institution. Some of the men included in this group were epileptics, some cripples, and some men in good health. There were a few young men, but most had reached middle age and some were aged. Judged by the amounts of food which were sent to this ward, these men on an average were hearty eaters, though very few of them appeared to be strong and healthy. Only 8 of the group were classed as workers.

The men in this dining room had their breakfast early, being through the meal by 6 in the morning. They had their dinner about 12 and their supper a little before 6 o'clock p. m.

The dining room and service did not differ in any important particular from those previously described.

The amounts of protein and energy consumed and wasted during the study are shown in the following table, the data being recorded for the entire period and not for the individual days, as was the case in studies Nos. 682, 683, and 684.

*Amounts of protein and energy eaten and wasted, per man per day, dietary study No. 685.*

Food materials.	Amounts eaten.		Amounts wasted.	
	Protein.	Energy.	Protein.	Energy.
Animal food:				
Beef, boiled (1).....	11	103		
Pork, shoulder, boiled (23).....	4	71		
Butter (31).....		36		
Milk (33).....	4	80		
Total animal food.....	19	290		
Vegetable food:				
Bread (4).....	54	1,234		3
Sugar (46).....		99		
Cabbage sprouts, boiled (5).....	3	69		
Onion tops, spring onions (59).....		9		
Sauce from evaporated apples (14).....		20		
Total vegetable food.....	57	1,431		3
Miscellaneous food:				
Soup (15).....	35	553	1	6
Broth from soup (11).....				2
Total miscellaneous food.....	35	553	1	8
Total food <sup>a</sup> .....	111	2,274	1	11

<sup>a</sup> Of this, 3 grams of protein and 76 calories of energy were served to special-diet patients only.

The results of this study show an average consumption of 111 grams protein and 2,274 calories of energy per man per day. The waste was less than 1 per cent of the food served, an extremely small proportion. In fact, it was so small that it was scarcely worth taking account of. It should also be noted that no food was returned to the kitchen. Usually all the food sent was eaten, but if any food was not served it was saved in the dining room for the next meal, or was eaten between meals.

#### WASTE.

The average amounts of waste for the three studies with men were about 2 per cent only of the average amount served, much less than is to be expected in institutions of this kind. Judging from the available data on this subject, one may fairly consider any waste under 8 or 10 per cent of the food served to be small. It would, there-

fore, seem that the management had decreased these amounts as much as possible without danger of undersupplying the inmates. The waste in the women's dining room, though somewhat larger than the average for the three studies with men, was still remarkably small.

The small amounts of waste may be due either to a lack of sufficient quantities of food, which tends to make the subjects consume all that is available for them, or to care on the part of the institution authorities in planning the quantities necessary so closely that all may have a sufficiency and yet nothing be wasted. In this connection it should be noted that the diet was peculiar in that the food served was of such a nature that it did not allow of much waste, unless the quantities served should be too great. Thus the meat which was served had all the bones removed before being sent to the tables, so that there was no loss from meat adhering to bones, while the bread which was not used could easily be returned for another meal (except such as was placed upon the individual plates). That the management had planned the diet with a view to avoiding waste was evident from the nature of the foods served, and, as has already been stated, it was apportioned to the several dining rooms with exceptional care and good judgment. That the subjects in study No. 682 had sufficient food can not be questioned, yet in this study the waste is as small as with the others. This would seem to show pretty conclusively that the very small waste was due to care in the selection and preparation of food on the part of the officials of the institution. Such a condition of affairs is eminently desirable in public institutions and speaks most highly for the management.

**AMOUNT EATEN PER PERSON AS SHOWN BY TOTAL AMOUNTS PURCHASED.**

As a means of learning more regarding the amount of food actually consumed in different dining rooms in the institution, it was thought best to estimate the quantity of nutrients and energy of the diet from the kind and amounts of food purchased for the inmates. To this end recourse was had to the books of the institution, and a table has been prepared showing the amounts of food annually purchased for the use of the inmates, and also the amount of farm products raised at Bayview for home consumption. From the data thus obtained, showing the total amount of food provided, the protein, fat, and carbohydrates supplied were calculated, as well as the average amount obtained per person per day. The data thus obtained form practically a dietary study for a year for all the inmates. Such data are especially useful where regular detailed studies of a large part of the population are not made, as was the case at Bayview, because they give some idea as to the average food consumption of all the inmates of the institution throughout the year. The data are summarized in the table following.

## Food provided for inmates during entire year, and nutrients contained in it.

Reference number.	Food materials.	Total weight.	Protein.	Fat.	Carbo-hydrates.
ANIMAL FOOD.					
16	Meats and fish:				
Beef, fore quarter, lean.....	Pounds.	Kilograms.	Kilograms.	Kilograms.	Kilograms.
207,109	93,944.6	13,809.9	8,924.7	-----	-----
Mutton, side.....	26,000	11,793.6	1,533.2	2,830.5	-----
Pork, side, not including lard and kidney.....	5,794	2,628.2	210.3	1,287.8	-----
Bacon, shoulder, smoked, medium fat.....	46,072	20,898.3	2,716.8	5,558.9	-----
Sausage.....	2,300	1,043.3	135.6	461.1	11.5
Poultry.....	2,148	974.3	133.5	119.8	-----
Herring, fresh and salt.....	4,900	2,222.7	248.9	86.7	-----
Eggs.....	25,358	11,502.4	1,506.8	1,069.7	-----
Dairy products:					
Butter.....	13,759	6,241.1	62.4	5,304.9	-----
Cheese.....	3,867	1,754.1	484.3	591.1	42.1
Milk.....	260,018	117,944.2	3,892.2	4,717.8	5,897.2
Lard.....	800	362.9	-----	362.9	-----
VEGETABLE FOOD.					
Cereals:					
Wheat flour, spring and winter wheat.....	362,208	164,297.5	18,729.9	1,643.0	122,401.7
Hominy.....	1,100	499.0	41.4	3.0	394.2
Oats, rolled.....	6,048	2,743.4	458.1	200.3	1,816.1
Rice.....	11,933	5,412.8	433.0	16.2	4,276.1
Rice flour.....	196	88.9	7.6	5.4	60.5
Crackers, soda.....	2,043	926.7	90.8	84.3	677.4
Crackers, water.....	3,633	1,647.9	192.8	82.4	1,247.5
Cakes, mixed.....	714	323.9	28.2	27.9	241.3
Ginger snaps.....	2,027	919.4	59.8	79.1	698.8
Sugars:					
Candy.....	680	308.4	-----	-----	296.
Molasses.....	10,212	4,632.2	111.2	-----	3,210.1
Sugar.....	29,651	13,449.7	-----	-----	12,777.2
Vegetables:					
Beans, pea, dried.....	3,758	1,704.6	383.5	30.7	1,016.0
Beans, Lima, dried.....	425	192.8	34.9	2.9	127.0
Beans, Lima, fresh.....	3,276	1,486.0	47.6	4.5	147.1
Beans, string.....	4,472	2,028.5	42.6	6.1	140.0
Beets.....	2,711	1,229.7	16.0	1.2	94.7
Cabbage.....	32,451	14,719.8	206.1	29.4	706.5
Carrots.....	8,921	4,046.6	36.4	8.1	299.4
Cauliflower.....	922	418.2	7.5	2.1	19.7
Celery.....	900	408.2	3.7	.4	10.6
Corn.....	10,481	4,754.2	57.1	19.0	366.1
Lettuce.....	378	171.5	1.7	.3	4.3
Onions.....	3,258	1,477.8	20.7	4.4	131.5
Onion tops, spring onions.....	878	393.3	4.0	.4	44.6
Parsley.....	72	32.7	-----	-----	-----
Parsnips.....	10,206	4,629.4	60.2	18.5	500.0
Peas, green.....	1,188	538.9	19.4	1.1	52.8
Potatoes.....	133,688	60,640.9	1,091.5	60.6	8,914.2
Radishes.....	3,065	1,390.3	12.5	1.4	55.6
Ruta-bagas.....	10,714	4,859.9	43.7	4.9	291.6
Salsify.....	822	372.9	4.8	1.5	40.3
Sauerkraut.....	950	430.9	7.3	2.2	16.4
Spinach.....	1,733	786.1	16.5	2.4	25.2
Squash.....	9,007	4,085.6	28.6	8.2	183.9
Tomatoes.....	69,208	31,392.7	282.5	125.6	1,224.3
Turnips.....	22,501	10,206.5	91.9	10.2	581.8
Fruits:					
Apples.....	775	351.5	1.1	1.1	38.0
Apples, dried.....	10,610	4,812.7	77.0	105.9	3,181.2
Peaches, dried.....	251	113.9	5.4	1.1	71.2
Prunes, dried.....	1,000	453.6	8.2	-----	282.1
Miscellaneous:					
Coffee, Rio.....	26,053	11,817.6	-----	-----	-----
Rye (for coffee).....	18,424	8,357.1	-----	-----	-----
Total.....	-----	644,848.9	47,469.1	33,911.7	172,613.9
Nutrients <sup>a</sup> per person per day.....	-----	-----	96	69	351

<sup>a</sup> These quantities would give a total of 2,398 calories per person per day.

In collecting such data no allowance could be made for amounts on hand at the beginning and end of the period covered by the figures, but it is believed that this does not introduce any great error, as the amounts were presumably not very different.

The table from its very nature is not entirely accurate, for the reason that in making it up a number of assumptions were necessary. The assumptions were, however, made as carefully as possible, largely with the help of one of the institution officials, and it is believed that they are not very far from the truth. In the first place, it was not always possible to obtain the amounts of foods purchased for inmates distinct from that purchased for employees, and in such cases estimates had to be made, based on the proportion of the two classes to one another. Also there were certain articles of food purchased which were not supplied to the inmates as a whole, but only to a certain number of them. Such, for example, are eggs, which were served almost exclusively to sick or infirm patients. In the second place, more or less error was unquestionably introduced in estimating the weights of the various articles which were recorded in bulk. Particularly is this true of the farm products, the data for which were taken from the report of the city board of charities for 1904. These products were given variously in bundles, bushels, heads, barrels, etc., the weights of which could not be accurately determined, since they may vary within considerable limits. However, it is not likely that the errors are important, since the farm products, which introduced the chief uncertainty, form only a minor part of the whole food supply for the entire year.

The data in the table (p. 37) show the total amounts of nutrients in the food consumed by the inmates during one year to have been, respectively, 47,469.1 kilograms protein, 33,911.7 kilograms fat, and 172,613.9 kilograms carbohydrates. By dividing these by 365, the number of days in a year, and the quotients thus obtained by 1,348, the average daily population of Bayview for the year ending December 31, 1904,<sup>a</sup> the amounts supplied per person per day are found, namely, 96 grams protein, 69 grams fat, and 351 grams carbohydrates, with a total fuel value of 2,398 calories.

As is discussed on page 36, the waste in this institution was very small, probably not greater, on the average, than 3 per cent of the food provided. Allowing for this proportion of waste, the amount actually eaten per person per day would be 93 grams protein, 67 grams fat, and 340 grams carbohydrates. These amounts are considerably smaller than the per capita allowance at the Government

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<sup>a</sup> Since the table represents purchases of food from May, 1904, to May, 1905, this average does not represent precisely the same period. It is not believed, however, that the true figures would be enough different to change the results by more than one or two units either way.

Hospital for the Insane,<sup>a</sup> but the studies are not directly comparable, for the reason that the latter includes a far greater proportion of employees with very much greater muscular activity, and also for the reason that at Bayview the ratio of hospital patients, other than insane, to the total number of inmates is greater. It is interesting to note that the figures in the table (p. 37) agree closely with the standard (100 grams protein and 2,950 calories of energy) proposed by Atwater<sup>b</sup> for insane hospitals as regards protein, and show a somewhat smaller amount of energy than he proposed. These points will be more fully discussed later (p. 40).

#### COST OF THE FOOD.

It is interesting to compare the cost of the food per person per day at Bayview with similar data regarding other institutions and families. As nearly as this factor can be calculated, it was 6.94 cents per day. In nine public institutions studied by Mrs. Ellen H. Richards and Miss Sarah E. Wentworth<sup>c</sup> for the institution commissioner of Boston, the cost of food for inmates ranged from 5.29 to 9.89 cents per person per day. In the institutions which may perhaps be most properly compared with Bayview, namely, the Long Island and the Charleston almshouses, it was 7.54 and 7.73 cents, respectively.

In families where such data have been recorded in connection with the dietary investigations carried on under the auspices of this Office, the cost of food per person per day has shown considerable range, being very low in a number of cases and very high in others. In the case of families living in the thickly congested districts of New York, Chicago, and Philadelphia, many of them of the type ordinarily receiving aid from charitable organizations, the cost of food has ranged from 9 cents to 42 cents per person per day. With families living in rural regions, the cost has been 5 to 28 cents. With families of professional men and others in similar circumstances, a range of 22 to 40 cents per person per day has been noted. With college students and college clubs the range has been from 17 cents to 97 cents. Judged by these values, which, though not numerous enough for final deductions, may yet be fairly regarded as showing something of the actual cost of food, it will be seen that the diet at Bayview was very low in cost.

<sup>a</sup> U. S. Dept. Agr., Office Expt. Stats. Bul. 150.

<sup>b</sup> Dietetics in Relation to Hospitals for the Insane. U. S. Dept. Agr., Office Expt. Stats. Rpt. 1904, p. 473.

<sup>c</sup> Rpt. Inst. Comm. [Boston], 2 (1897), p. 206.

**RESULTS OF DIETARY STUDIES AT BAYVIEW.**

The principal objects of the dietary studies in the old-age home, as previously stated, were to secure data regarding the amounts of nutrients and energy in the diet of the aged men and women, and to learn something of the adequacy and suitability of the dietary with a view to supplying information which would be of value in judging of the institution food situation as a whole, and for making changes in the dietaries, should this seem necessary and desirable, and also for the collection of data of use in general discussions of nutrition problems.

It is difficult to compare the results of studies at these institutions with dietary standards, since the activity of the different individuals of any given group varied very greatly. If the commonly accepted American dietary standards are to be used, it is necessary to select a standard for each group which will, so far as possible, conform to the amount of muscular work performed by the average individual of the group studied, and in making such a selection it seems better to err on the side of too high values than too low, as every precaution should be taken in institution dietetics to avoid any tendency toward underfeeding.

For the dietary study with regular patients and stable hands who had their meals in the men's dining room (study No. 682), the standard for a man performing light to moderate work, namely, 112 grams protein and 3,050 calories of energy, seems best for purposes of comparison. This group undoubtedly included the most active of the men studied, yet it was evident that they did not perform an amount of work equivalent to the average day's labor in the factory or on the farm. The diet corresponds with the standard selected very closely as regards energy and exceeds it as regards protein. While the amount of protein was not excessive when we consider that the time covered by the dietary study was short, and that, perhaps, the amount at other times would be somewhat less, there is no reason to suppose that these men could have required more protein than an average man outside the institution receives in his food.

The ration allowance computed from the food purchased for a year, namely, 96 grams protein and 2,398 calories of energy, was probably amply sufficient when we recall that the proportion of invalids and hospital-ward patients was large, as was also the proportion of aged and infirm inmates.

For the chronic and special diet patients included in dietary study No. 683, it seems hardly fair to use a standard for persons in health, since it is believed that the group did not represent the conditions which the standard is intended to cover. It seems certain that these men and women had all they could eat of the food provided, and

although they might have been tempted by a more varied diet to eat larger amounts, yet it does not seem at all probable that the energy supplied was insufficient for their needs, although it is somewhat lower than the value, 2,700 calories, for a man of sedentary occupation. On the other hand, the protein requirement is in almost exact accord with the amount included in this standard.

Dietary study No. 685, with men in the receiving ward, shows a food consumption of 111 grams of protein and 2,274 calories of energy. The subjects were not nearly as active as those of study No. 682, who obtained somewhat larger amounts of protein and energy, and it seems that their food requirements could not have been greater than those of "men with very little muscular exercise," namely, 90 grams of protein and 2,450 calories of energy, according to the commonly accepted American dietary standards. Judged by these values the dietary may be considered adequate as regards protein and energy. There were a number of young men in this group whose food consumption would naturally be greater than that of the old men in studies Nos. 682 and 683, and this probably accounts for the greater average amounts of food eaten.

Dietary study No. 684, made with women inmates, shows that the amounts of protein and energy obtained were 85 grams and 1,924 calories, respectively, per woman per day. Only half the women included in this group were classed as workers. Some of them were undoubtedly quite active, yet it seems fair to say that, considering the group as a whole, the degree of muscular activity was not great. The suggested dietary standards for women performing light to moderate muscular work call for 90 grams protein and 2,450 calories of energy, and the suggested standard for women having light exercise, 80 grams protein and 2,250 calories. Perhaps the best values for comparison with the group studied would be an average of these two standards, namely, 85 grams of protein and 2,350 calories of energy per day. Compared with such values, the results obtained with the group of women studied show close agreement as regards protein, but a deficiency of about 400 calories as regards energy. The standard selected for the comparison refers to women in full bodily vigor, but many of those studied, as previously stated, were aged and infirm. When it is also remembered that the general health and appearance of the women of this group remained as good as usual, it does not seem probable that the diet supplied less nutritive material than was required. It would be a simple matter, however, to increase the energy value by adding some simple dishes to the menu, as stated above.

One reason for believing that the women included in dietary study No. 684 received sufficient food for their needs is that the waste, though relatively small, was greater than was noted in the other

studies made at Bayview. It is a matter of general observation that where the food is of good quality little, if anything, will be wasted unless more is provided than is required.

In general, it may be said that if the rations had not been sufficient for the inmates, losses in weight would have been very commonly noted and the physical condition of the inmates would not have been maintained. Many of the inmates were aged and infirm, and they naturally become more feeble with each year that passes; but it was the opinion of the officers in charge of the institutions that, as a whole, the inmates maintained their physical condition and showed improvement rather than the reverse, which would indicate that the food supplied sufficient nutritive material for their body needs. Especial pains were taken to learn the opinions of the inmates regarding the sufficiency of the food supplied, and no one was found who expressed a belief that the dietaries were insufficient. The food was necessarily simple, and no great variety was possible at Bayview, and this lack of variety was frequently commented upon. A number of the inmates expressed dissatisfaction with some particular dish, but such complaints were neither uniform nor general, so it seems perhaps fair to assume that the dietary was reasonably well relished. Taken all in all, the dietaries here considered can fairly be considered as adequate when judged by the condition of the subjects fed, by comparison with commonly accepted dietary standards, and by comparison with the results obtained at other institutions and with the results of individual studies made with aged people.

There is no reason to suppose that the amounts of nutrients and energy furnished during the time these dietary studies were made differed very greatly from the amounts for other seasons, though it must be remembered that the studies were made in the late spring, a season which is perhaps least well calculated to give an especially favorable impression of the diet, since at this time of the year the vegetables stored for winter use are practically exhausted and the new crops have not matured. As fresh vegetables are high at this time of the year, they are, of course, hardly available, since the institution funds warrant the purchase only of staple foods of reasonable price. For these reasons it seems possible that the studies reported represent the minimum rather than the average amounts and the more meager rather than the more generous menus. With the more varied diet made possible by a freer use of vegetables, it is very probable that larger amounts of suitable foods would have been eaten owing to better appetite. The amounts of food necessary to bring the dietaries up to the standards as regards energy are relatively small. For instance, had the subjects of dietary study No. 685 received an ounce more of bread per meal, the energy value of the ration would have been somewhat more than 2,450 calories per day. A pound of

ginger cake per person per week would have brought up the energy value of dietary No. 683 sufficiently to make it conform to the Voit standard.

It is presumable that in the Bayview studies the aged persons ate less than the young and that dietary studies of individuals would have shown considerable variation from the average values for the group. If the group could be subdivided on a basis of age, it seems very probable that the diet could be more carefully adjusted to the actual needs of individuals. Such a change would mean somewhat smaller amounts for the aged, with little muscular work, and for the younger persons amounts which would conform to the commonly accepted standards suggested for persons performing an equivalent amount of muscular work. If the groups could be so subdivided, special attention should be paid to providing soft foods and light and easily digested dishes for the aged. Changes like those suggested would necessarily mean that more time must be spent in the preparation of food and would very probably mean an increase in the cost of the diet.

In discussing the Bayview almshouse dietaries it is interesting to note data regarding the Baltimore almshouse, reported some fifty years or more ago by J. S. Gould.<sup>a</sup> The data recorded include the bill of fare and in most cases the quantities served. The daily fare for nonworkers consisted of 8 ounces of bread with coffee for breakfast and a like amount of bread with tea for supper. On Mondays in winter dinner consisted of mush and molasses and in summer of rice and molasses. On Tuesdays and Thursdays 8 ounces of mutton made into soup and 4 ounces of bread made up the dinner and on Wednesdays and Saturdays 8 ounces of beef made into soup and 4 ounces of bread. The Friday dinner, like the Monday dinner, was mush or hominy and molasses. On Sunday 5 ounces of bacon or pork was provided and presumably 4 ounces of bread. Workers received in addition to the above 12 ounces of fresh meat or 9 ounces of bacon per day. In calculating the nutritive value of the soup it was assumed that a small quantity of potatoes or some similar material was used in its preparation, as is almost always the case, and it was necessary to make some assumptions regarding the amounts of mush and molasses eaten. Average values for the composition of the different foods were used in computing the nutritive value of the rations. As calculated, the dietary for nonworkers furnished 78 grams protein and 1,959 calories of energy and the diet for workers 85 grams of protein and 2,067 calories of energy per man per day, values smaller as regards both protein and energy than those in the average of the four studies made at Bayview.

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<sup>a</sup> A Report on Food and Diet Suited for Almshouses, Prisons, and Hospitals. New York, 1852, p. 79.

As may be seen from the figures in the table (p. 83), the different groups studied at Bayview received in their daily fare about the same quantities of protein and energy as the groups studied at the New York State hospitals for the insane, the Massachusetts almshouses, the Munich homes for the aged, and the Scotch poorhouses, where pauper lunatics are cared for. It will be seen that the Bayview dietaries contained somewhat more protein than the average of the dietaries regarded as deficient and somewhat less energy. No data were reported regarding the number of aged persons in the Scotch institutions, but it is perhaps fair to assume that no considerable number of them were aged and infirm persons, and the difference in the nutrients and energy value of the respective dietaries is perhaps explainable on this basis, as there is reason for believing that the Bayview dietary was as adequate as the dietaries considered adequate in the Scotch institutions.

In order to compare the rations in these dietaries with the maintenance rations suggested by Maurel it would be necessary to know the weights of the subjects. Unfortunately, it was not feasible to have the subjects weighed during any of the studies, but 25 average-sized inmates of each sex were weighed at Bayview a few months later and the average weight of the men was found to be 145 pounds (66 kilograms) and of the women 118 pounds (54 kilograms). Assuming these figures to be applicable to the whole institution, the weights would indicate that the men averaged about 60 years of age and the women slightly more. Maurel's maintenance ration for the men, then, would call for 82 grams of protein and 1,965 calories of energy, and the average Bayview ration supplied in excess of this 39 grams of protein and 539 calories of energy, amounts amply sufficient for the slight external activity of the subjects. In the case of the women, the dietaries supplied 18 grams of protein and 312 calories of energy more than Maurel's maintenance ration for a woman of 70 years weighing 54 kilograms—probably ample protein and excessive energy for the slight external muscular work performed.

In planning institution dietaries, whether for the aged, the middle-aged, or the young, humanity demands that some account be taken of the comfort as well as the bare nutritive requirements of the inmates, especially when they have become wards of the public through no fault of their own. To what extent the dietitian is justified in going beyond the minimum ration which is consistent with safety, or beyond the minimum cost for the sake of variety, must depend upon the character of the institution and the funds at its disposal. There are, however, many methods by which variety can be increased with little or no increase in cost.

Dunlop,<sup>a</sup> in a discussion of some of the essential points of a good institution dietary, states that it must contain a sufficient quantity of energy-yielding food and sufficient protein as compared with the commonly accepted dietary standards, and that it shall not contain an excess of carbohydrates or, in other words, fat and carbohydrates must be present in a reasonable ratio. The inmates must be classified, both as to sex and the amount of work performed. The diet must be divided into meals of reasonable amount, must be of sufficient variety and pleasing, must contain a sufficient amount of condiments and a fair allowance of potatoes or other fresh vegetables.

In dietary studies which were undertaken in Scotch prisons by him,<sup>b</sup> it was observed that the subjects lost weight and were discontented with a ration which supplied less energy than the usually accepted dietary standards called for, and that when this deficiency was made good by increasing the bread allowance somewhat, the complaints ceased and weight was maintained. In the Scotch institutions studied it seems probable that no large proportion of the inmates were aged and infirm, and this may account for the fact that they seemed to require somewhat larger amounts of energy for maintenance than the groups studied in Baltimore. In planning institution dietetics it is obvious that the aim should be to supply too much food rather than too little, as the inmates should not be generally undernourished. As previously noted (p. 21), bread was supplied at Bayview, so the inmates could have increased the energy value of their diet by eating more bread, if the appetites were not satisfied. If it seemed desirable to increase the energy somewhat by providing some food which would supplement the energy value of the diet in a more appetizing way than an increased consumption of bread, this could be readily done with little expense by adding gingerbread occasionally to the dinner or supper menu, or some other inexpensive dish, like macaroni cooked with cheese or tomatoes, or baked beans. These dishes, which commonly form a part of the diet in many public institutions, would also increase the proteid value of the dietary and would undoubtedly do much to relieve the monotony of the diet and add to its palatability.

To secure the needed variety in institution dietetics Dunlop<sup>a</sup> states that changes in the dinner menus must be relied upon to a great extent, and supper and breakfast almost always of necessity consist of bread and tea or coffee or some similar combination. To secure this variety in the dinners he suggests that no individual soup, broth

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<sup>a</sup> Report on dieting of pauper lunatics in asylums and lunatic wards of poor-houses in Scotland. Ann. Rpt. Gen. Bd. Comrs. Lunacy Scot., 43 (1902), Sup.

<sup>b</sup> Scot. Med. and Surg. Jour., 8 (1901), p. 405.

excepted, should be served oftener than twice a week; that the meat and the method of cooking it should be varied, boiled beef being served not oftener than three times weekly. Puddings, sweetened and flavored, should be supplied at times. The same menu should not be served oftener than twice a week, and the weekly routine should be periodically revised and made to include seasonable dishes. Rhubarb, apples, etc., should be used when readily procurable. Such factors were considered in planning the Bayview rations, and in the other homes for the aged where studies were made it was possible to pay even more attention to such matters, as the resources were more abundant.

When dietary conditions at Bayview were made a subject of special attention several years before the dietary studies reported in this bulletin were carried on (p. 18), a number of changes were introduced which added much to the comfort of the inmates, and which are of a sort which should always be possible when needed, as they do not involve increased expenditure. For instance, cereal breakfast foods were introduced as a breakfast dish in place of some of the bread previously issued, and were much appreciated by aged persons to whose needs soft foods are especially suited. Recognizing the fact that the flavor of browned meat is very appetizing to most palates, care was taken to provide at intervals meat thus cooked, instead of meat boiled in soup, which is such a universal dish in public institutions. Other similar changes were made in the menus which, though inexpensive and entailing little additional labor, added much to the palatability of the diet.

#### **DIETARY STUDIES IN HOMES FOR THE AGED AND ORPHAN ASYLUMS UNDER PRIVATE MANAGEMENT.**

The five studies in institutions in Baltimore reported in the following pages were conducted a year later than those at Bayview, and the data were collected by H. L. Knight of this Office. Three of the studies (Nos. 686 to 688) were made in homes for the aged under private management, one (No. 690) in an orphan asylum of the same character, and one (No. 689) in an orphan asylum supported largely by public funds. Each study lasted seven days. The general method followed was that sometimes known as "the family method," and described in detail in previous publications of this Office.<sup>a</sup> Records were made of all the kinds and amounts of food on hand at the beginning of the study, of those brought into the institution throughout its course, and of those remaining at the end. The difference between the first two and the last amounts was assumed to represent the food provided for the period under consideration. The refuse—that is, the

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<sup>a</sup> U. S. Dept. Agr., Farmers' Bul. 142; Office Expt. Stas. Bul. 150.

inedible material in some foods, such as bones, prune pits, eggshells, etc.—was, in most instances, separated and weighed, its amount being deducted from the weights of the foods as purchased to give the quantities of edible materials. In all such cases analyses of the edible portions of the foods are utilized in calculating the amount of nutritive material. In those instances in which determination of the amount of refuse was impracticable, recourse was had to analyses of materials as purchased. The waste was in each case carefully weighed and a composite sample retained for analysis, except in study No. 689, where the entire amount was saved and analyzed. The nutrients in the waste were calculated and subtracted from those found for the total food provided, and the difference was taken as the total amount eaten. The amount consumed per inmate per day was determined in the usual manner, by dividing the total food consumed by one-third of the aggregate number of meals served, due allowance being made for difference in sex, age, activity, etc., although in some instances the presence of groups of persons whose relative nutritive requirements were somewhat doubtful introduced complications which will be explained in connection with the individual studies.

Supplementary information as to the age, activity, body weight, etc., of the inmates was obtained whenever practicable.

#### **DIETARY STUDY NO. 686.**

The home for aged women in which this study was made is under the control of a board of management representing a Baltimore philanthropic association, which delegates the immediate charge to a house matron, assisted by a room matron and a nurse. The institution is supported largely by private funds, but the State makes an annual appropriation of \$3,000 for the joint use of this home and the affiliated home for aged men. Candidates for admission must be 60 years of age or over, the preference being given to older women; they must be of good character and without husband or children. An entrance fee is required varying from \$200 to \$300 according to the age of the applicant. For residents of other States than Maryland there is an additional charge of \$500. At the time of the study there were 75 inmates, all that the home could accommodate.

The building is a large three-storied brick structure erected about fifty years ago. It was in good condition but not modern. The kitchen, pantry, storerooms, and dining room were in the basement. At the time of the study a new range had just been installed in the kitchen, but there were few labor-saving devices, such as bread-mixing machines, bread slicers, etc. The dining room was large, well lighted, comfortably furnished, and well adapted to its purpose,

and was kept neat and clean. There were seven small tables seating from 6 to 12 persons each.

Meals were served at 7 a. m., 1 p. m., and 6 p. m., from April 1 to October 1, and at 7.30 a. m., 1 p. m., and 5 p. m. the remainder of the year. All inmates physically able were required to be present punctually. The attendance at meals varied considerably, not only on account of inability to come to the dining room, but because the inmates were generally allowed to visit friends outside the institution.

Those unable to come to the table were served in their rooms just before the regular meal hours. During the study about 20 women were thus served, though few of these were actually ill. The management hoped soon to install a passenger elevator in the building; with such an arrangement many of the inmates who are too feeble to climb stairs could have come to the dining room regularly. Since the completion of the study an elevator has been provided.

According to the rules of the home the "inmates are expected to make themselves useful in such ways as their services may be valuable for the benefit of the home." A few took care of the corridors, pared potatoes, and occasionally washed dishes, but in most cases they showed little inclination to do more than care for their own rooms and mend and iron their clothes.

The servants, 1 man and 7 or 8 women, were all negroes. The kitchen force consisted of a skillful and industrious cook and 3 helpers, who washed dishes, waited on table, etc. At the time of the study the house matron had but recently been appointed.

#### PURVEYING OF FOOD.

As there were no cold-storage facilities little attempt was made to buy in large quantities. The matron bought the meats and vegetables each day from the neighboring markets. Groceries were purchased twice a week, butter and eggs weekly. Potatoes were obtained by the bushel, flour and sugar by the barrel, and coffee and tea in 25-pound bags. It was a point of pride with the matron that the food purchased was invariably of good quality. Friends of the institution frequently sent donations of canned goods, fancy cookies, fruit, vegetables, and occasionally turkey or other such delicacy, and ice cream. These donations arrived somewhat irregularly; nevertheless it seemed to be the policy of the institution to depend upon them in considerable measure for the luxuries and variety of the table. In the opinion of the matron less than usual was sent in during the week of the study. The inmates were strictly forbidden to buy or solicit food from outside, as it was thought this might give the institution an undesirable reputation, but nevertheless some was undoubtedly smuggled in. The visitors who were allowed on Thursday and Friday afternoons also brought delicacies to their friends among the inmates. It was, of

course, impossible to determine how much was obtained in these two ways. One attendant thought it was as much as 10 per cent of the food eaten, but this estimate is probably too large. A good share of the inmates had no money, and careful observation indicated that while a few individuals received a not inconsiderable portion of their food in this way the average amount was not large. Moreover, the food thus obtained was mostly fruit, the nutritive value of which would be even less significant than the quantity. It seems safe to assume, therefore, that no great error is introduced into the results of this study by such unrecorded materials.

#### KINDS OF DIET.

The sick were given special diets when necessary, but at the time of the study there was little actual illness, and the meals served in the inmates' rooms differed from those in the dining room principally by the addition of jelly. Eggs, either raw or boiled, were furnished to any inmate who desired them in the place of meat at breakfast or dinner. Tea was served at each meal, and an alternative of coffee was offered at breakfast and supper.

The matrons and attendants ate in the dining room immediately after the inmates had finished. Their diet was the same as that of the inmates, except that they occasionally bought for themselves small amounts of fruit, vegetables, etc., for the sake of variety. These were not included among the foods measured, because they were believed to be in excess of the regular diet; that is, the matron and attendants ate the regular diet plus these supplemental foods, and to disregard them seemed to give a more accurate average for the institution.

No special diet was provided for the servants, who were expected to make their meals of what was left after the others had been served. They complained that this was frequently insufficient, and it is undeniable that the supply of one or more articles was sometimes exhausted in the dining room. There was always, however, an unlimited supply of bread.

#### METHOD OF SERVING.

Most foods were placed on the tables in large dishes and the inmates allowed to help themselves. Bread was provided ad libitum at all meals, as were milk and sugar for the tea and coffee. Butter, oatmeal, some vegetables, and fruit were served in individual portions. A second helping was allowed when practicable, but was seldom called for.

#### UTILIZATION OF REMNANTS.

Since the food returned from the tables was largely consumed by the servants, but little had to be utilized in other ways. Any butter

remaining on the butter plates was collected after the meal by the matron and used in cooking. The sliced bread, of which considerable quantities were returned from the table, was allowed to accumulate until there was enough to serve either fried as "French toast" or toasted. Twice during the study bread which had become very dry was thrown away by the servants, but this was contrary to the matron's orders.

#### AGE, WEIGHT, AND HEIGHT OF INMATES.

Unfortunately it was impracticable to get definite information on these points during the study. Ten months later the secretary of the home reported that the minimum age of inmates was 65, the maximum 90, and the average 76 years, and these statistics had probably not been materially altered by deaths or new admissions since the study was made. The high minimum age is significant. While women may be admitted at 60, the number of applicants is so great that they are rarely taken at ages under 65.

There was no opportunity to weigh the inmates during the study, and the only way of obtaining an idea of their weight was to estimate it by carefully noting the size of the women as they passed into the dining room. This was done on two successive days, and as the inmates entered in different orders on the two days and the two estimates were very similar, it is thought worth while to note the estimated average, namely, 131 pounds. To estimate their height a mark was made 5 feet from the ground on the post of the doorway through which the inmates entered, and the height of each woman was estimated as she passed through. The figures obtained in this way averaged 5 feet 1 inch. Of course both these measurements are too crude to have any but a most general significance.

The character of the meals served during the study is indicated by the following sample menu:

#### MENU FOR SATURDAY, MAY 12, 1906.

**Breakfast:** Pork sausage, fried; rolled oats, tea, coffee, butter, bread, milk, sugar.

**Dinner:** Potatoes, boiled or baked; spinach, beefsteak, bread, butter, sugar, milk, tea.

**Supper:** Gingerbread, white bread, tea or coffee, milk, butter, sugar.

#### ATTENDANCE.

One day was spent in preliminary observations at the home; the study proper began with dinner on May 11, 1906, and was continued for a full week of 21 meals. During that time 967 meals were served to inmates at the main table, 414 to inmates in their rooms, 52 to attendants, 143 to female servants, 17 to male servants, and 2 to the observer, making a total of 1,595, or the equivalent of one person for

532 days. While the attendants and servants undoubtedly ate more than the inmates, the difference is not believed to be sufficiently large to introduce a significant error if ignored in the calculation of the results of the study, and so no attempt has been made to include such a correction in calculating the results.

A word of explanation should perhaps be given concerning the material designated "Food unused at end of study" in the table following. This represents either foods which had been returned from the dining room and would be utilized at later meals, or, as in the case of tallow, parts of the raw materials set aside during their preparation. Since it forms part of the food measured, its nutrients must, of course, be subtracted from those of the total food in order to determine the amounts actually consumed, but it is in no wise to be considered as waste.

*Weight of total food, and protein and fuel value of food per woman per day,  
dietary study No. 686.*

Kinds and amounts of food materials.	Amounts per woman per day.	
	Protein.	Fuel value.
ANIMAL FOOD.		
Beef: Ribs, 23.88 pounds (2); round, 35.19 pounds (4); shoulder and clod, 9.31 pounds (6); steak, Hamburg, 12.44 pounds (11); dried, salted, and smoked, 7 pounds (13).....	Grams. 15.7	Calories. 177
Lamb: Leg, 21.31 pounds (15).....	3.5	42
Pork: Fresh chuck, ribs, and shoulder, 22.44 pounds (19); ham, fresh, 21.50 pounds (20); shoulder, smoked, 41.44 pounds (26).....	11.1	321
Sausage: Pork, 13.06 pounds (34).....	1.4	52
Fish: Weakfish, 24.38 pounds (36); cod, salt, 6.56 pounds (38); herring, salted and smoked, 36.25 pounds (39).....	16.2	116
Eggs: 25.50 pounds (41).....	2.6	30
Dairy products: Butter, 18.44 pounds (42); cheese, full cream, 3.31 pounds (43); milk, 430 pounds (44).....	13.0	163
Lard: 17.38 pounds (47).....		138
Total animal food.....	63.5	1,039
VEGETABLE FOOD.		
Cereals: Corn meal, granular, 13.31 pounds (50); oats, rolled, 25.44 pounds (53); rice, 4.19 pounds (55); wheat flour, 253.19 pounds (59); macaroni, 5.06 pounds (63).....	28.9	939
Sugars, etc.: Molasses, 9.75 pounds (77); sugar, granulated, 93.19 pounds (79).....	.2	349
Vegetables: Greens, dandelion, 14.44 pounds (91); lettuce, 8.25 pounds (94); onions, 2 pounds (95); potatoes, 216.13 pounds (100); rhubarb, 13.88 pounds (102); spinach, 19.13 pounds (105); tomatoes, canned, 15.13 pounds (111).....	4.3	146
Fruits: Lemons, 0.50 pound (117); peaches, dried, 6 pounds (121); raisins, seeded, 2 pounds (125); plums, preserved, 9.19 pounds (129); jelly, plum, 0.75 pound (132).....	.3	41
Total vegetable food.....	33.7	1,475
Total food.....	97.2	2,514
FOOD UNCONSUMED.		
Unused at end of study: Beef, roast, cooked 2 pounds (9); ham, smoked, fried, 0.94 pound (25); herring, fried, 1.06 pounds (40); tallow, 1.75 pounds (4.8); oats, rolled, cooked, 2 pounds (54); bread, wheat, 24.88 pounds (66); peaches, stewed, 0.75 pound (122).....	2.9	83
Waste: 200.25 pounds (139).....	9.0	225
Total food unconsumed.....	11.9	308
Total food consumed.....	85.3	2,206

## WASTE.

The waste from each meal was weighed, run through a meat chopper, and thoroughly mixed; a 10 per cent sample was then removed for analysis, a few drops of a 40 per cent solution of formaldehyde being added to prevent decomposition. In this study kitchen and table waste were measured and analyzed together, amounting in all to 200 pounds 4 ounces, and containing about 10 per cent of the protein and energy of the food. While this is not a large proportion as compared with that found in many public institutions, it is somewhat higher than that in the other studies of this series. At least a partial explanation lies in the fact that so many meals were served to the inmates in their rooms. Since there was no chance for a second helping in these cases, it was necessary to send up generous portions, considerable quantities of which were returned uneaten, and for sanitary reasons thrown away. In order to determine how great was this loss, the waste returned from the private rooms was kept separate from that from the kitchen and dining room. It was found that the total waste from the kitchen and dining room was but 96 pounds 3 ounces, a little less than one-half the total. On the other hand, that from the separate meals, which served less than one-third of the total population, was 104 pounds 1 ounce, of which 22 pounds 5 ounces was bread, 28 pounds 12 ounces solid food other than bread, and 53 pounds liquid waste, chiefly tea and coffee, to which milk and sugar had been added. The wasted bread alone contained 932 grams protein and 27,814 calories of available energy, or about 20 per cent of the nutrients of the total waste. As long as the present practice of serving so many meals in rooms was continued, this source of waste seemed likely to remain, for it would have been a difficult matter to decrease the size of the portions served without giving offense. Now that the desired passenger elevator has been installed, this loss should be considerably diminished. At the time of the study, meals were sent up to about 20 inmates, of whom all but 5 or 6 could have come to the dining room in an elevator, and not only the labor of serving them in their rooms but also considerable food could thus have been saved.

## ADEQUACY OF THE DIET.

An earnest attempt was made to get the frank opinion of the inmates regarding the diet at the home, and no complaints were made as to the quantity of food. The desire to obtain special food from outside might seem an indication of insufficient rations, but the true reason probably lay rather in the wish to secure variety and luxuries, which the institution could not be expected to furnish. Careful observation of the inmates gave no reason to suppose that they were not abundantly supplied with the necessary food.

As regards the amounts of protein and energy actually eaten, the table (p. 51) shows them to be 85 grams of protein and 2,206 calories of energy per woman per day. These figures are almost identical with the proposed standard—85 grams protein and 2,200 calories energy. Such a very close agreement, of course, has no special significance, but since there is no reason to suppose that the diet in this study was not well adapted to the needs of its subjects, it may be considered a corroboration of the standard.

#### COST AND SELECTION OF FOOD.

According to the report of the home for 1906 the expenditure for provisions during that year was as follows: Meats, \$1,630.74; poultry and fish, \$342.76; milk, butter, eggs, and ice, \$1,466.54; groceries, \$1,115.63; vegetables, \$533.48; making a total of \$5,089.15. Judging by the cost of the ice used in the men's home, it may fairly be assumed that \$100 was spent for this item in the women's home; subtracting this from the total sum, we find the amount expended for food alone to be \$4,989.15. With an average population of 76 this is equivalent to \$1.26 per inmate per week, or 18 cents per day.

While this amount is larger than that found in the German Aged Peoples' Home (see p. 59), it can not be considered excessive for the quality of the food provided. A diet supplying equal amounts of nutrients at less cost could easily be selected, but it is very doubtful whether such a change would prove either acceptable or wise. The situation in this home is not that in a free public institution. The inmates in general have come from comfortable homes and have paid a considerable sum on admission; they would be justified therefore in demanding a certain amount of the more expensive foods which give variety in the diet. While it was the policy of the institution to pay considerable attention to economy, an effort was also made to provide foods of the same general character as those to which the inmates had been accustomed before their admission. For example, it was a peculiar feature of the diet that very few of the cheaper cuts of meat, particularly those suited for soup making, were used; the matron feared that the introduction of such materials would arouse dissatisfaction, as savoring somewhat of the practice in the institutions for the poor. Whether or not this prejudice could be overcome is an open question. Such meats are very palatable when used as well-seasoned stews, as beef a la mode, and in similar ways, and of course often appear on the table of families in comfortable circumstances. It would seem to an outsider that money might occasionally have been saved in this way and expended, say, for desserts, of which none were regularly provided. Similarly, the use of tub butter in the place of pound prints for table use, and the substitution of something cheaper for cooking, would have made a considerable saving without

rendering the food less attractive. Another minor point is also suggested by a study of menus. Rolled oats were served every morning as breakfast cereal, and there was some complaint of monotony. While the oats are probably as cheap as any cereal, the occasional substitution of a similar wheat or corn preparation, or even of a ready-to-eat cereal, would have obviated this criticism without adding more than a few cents to the cost of the meal. An unsuspected source of loss was brought to light by the study; previously, the weight of goods purchased had not been checked on their arrival at the home, and when they were weighed by the observer it was found that some of the dealers were sending short measure; the matron at once procured a pair of spring balances and stopped this practice.

It should be remembered that many items of the diet came as gifts from friends of the institution and are not included in the expenditures. As they include practically all the more expensive materials, their money value must have amounted to a considerable sum during the year, a fact which should be borne in mind in comparing the cost in this and other studies. From the point of view of the dietitian it would probably have been more convenient to receive the money equivalent of such gifts and expend it for similar luxuries at discretion rather than to depend on the irregular donations in kind for this part of the diet. It may well be, however, that the more direct personal interest which such donations foster between an institution and its friends more than compensates for the inconvenience. As was previously stated, the matron thought that these gifts were less numerous than usual during the week of the study.

Other conditions may also cause slight variations in the character of the diet from week to week, but it is believed that if due allowance be made for the season of the year, the results of this study are fairly typical of the usual diet. All things considered, they indicate that the institution was getting a fair return for its expenditures for food.

#### DIETARY STUDY NO. 687.

The home for aged men in which this study was made is under the same management as the home for aged women (see study No. 686), and the regulations under which its inmates are received and governed are practically the same as in that institution. At the time the study was made it was in charge of a man and his wife who had served as superintendent and matron for seventeen years. They were aided by an assistant matron and 6 negro servants, 2 men and 4 women. The building, which adjoins the home for aged women, resembles it in general appearance and arrangement, though it was erected ten years later, and is smaller, accommodating only 50 inmates. The kitchen, storerooms, and dining room are in the base-

ment. The kitchen and storerooms are small, and contained few labor-saving devices beyond a bread mixer. As in the women's home, a dumb-waiter connects with the upper stories. In the dining room was one long table, at which the inmates were served. The men left the table as quickly as they pleased, often remaining no longer than ten minutes and seldom more than fifteen. The superintendent and matrons had a small private dining room, in which they ate just after the inmates had finished. The servants ate in the kitchen, their food consisting largely of what was left from serving the main table.

At the time of the study there were 41 inmates, 3 of whom were aged women, who were temporarily accommodated here because of insufficient room in the women's home. Their meals were served in their rooms, as were those of 8 men too infirm to go to the dining room.

As in the women's home, the inmates showed little inclination to do any work beyond taking care of their rooms, though 2 of the men regularly wiped the dishes. The bodily activity of the men was probably a trifle greater than that of the women in the previous study. Ten months after the study the minimum age in the home was reported as 60, the maximum 89, and the average 75, and there is no reason to suppose that the figures had changed much in the interim.

#### PURVEYING OF FOOD.

The marketing was done daily by the superintendent, who showed good judgment in following the market and taking advantage of any favorable prices. The food purchased was invariably of good quality. Although the men's home depended largely upon donations for its delicacies, these seemed less frequent than in the women's home. Much less food was brought in by the inmates than in study No. 686.

#### KINDS OF DIET.

Whenever it was needed, a special diet was served to the sick, in which eggs, jellies, etc., were freely used. The attendants varied the regular diet by small amounts of fruit, etc., but not to any great extent. Such articles and the "extras" served to the sick are not listed in the menu, but are included and specially marked in the table on page 57; as they were eaten mainly in small proportions in excess of the regular diet, they were not considered in estimating the amounts of nutrients consumed per man per day.

#### METHOD OF SERVING.

The food was prepared mainly by the matron and her assistant, and was well cooked and neatly served. Most of the articles were

placed on the table in large dishes, from which the inmates helped themselves. Bread was supplied ad libitum, and a second helping of most other things allowed. The men were expected to eat everything on their plates, and usually did so. Butter was served in individual portions at breakfast and supper, but not at all at dinner. Milk and sugar were added to the tea and coffee and the cereals before serving. Milk was considered too expensive ever to be used as a beverage.

#### UTILIZATION OF REMNANTS.

As in the previous study, most of the food returned from the serving dishes on the tables was consumed by the servants. The butter remaining on the plates after all had finished was used to spread on the bread for the infirm and blind, a practice which seems unnecessarily economical.

The kind of meals served during the study is indicated by the following sample menu, which has been selected as a fair average:

#### MENU FOR MAY 19, 1906.

**Breakfast:** Irish stew (beef and potatoes), rolls, bread, butter, tea or coffee with milk and sugar.

**Dinner:** Roast mutton, boiled rice, lettuce salad, strawberries, sugar, bread, tea or coffee with milk and sugar.

**Supper:** Chipped beef with milk gravy, bread, butter, tea or coffee with milk and sugar, currant jelly.

#### ATTENDANCE.

After a day of preliminary observation the study began with supper on May 18, and was continued through 21 meals. During this period a total of 1,000 meals was served, 821 to men and 179 to women. The women in the home were of two classes, 5 attendants and servants and 3 elderly women who were awaiting transference to the women's home. While as a rule in such studies the food consumption of women is assumed to be 0.8 of that of men, this factor was not used. As regards the female attendants and servants, their bodily activity was so much greater than that of the inmates of either sex that if anything they ate more, rather than less, than the men. As regards the women inmates, their number was so small that no large error could be introduced in assuming that their food consumption differed very little from that of the elderly men. It therefore seemed most feasible to treat the population as homogeneous and to calculate the results on this basis, but to take the differences into account in interpreting them. Accordingly the figures per person per day in the following table were obtained by dividing the total amounts of protein and energy by 333, one-third of the total number of meals served.

*Weight of total food, and protein and fuel value of food per man per day,  
dietary study No. 687.*

		Amounts per man per day.	
Kinds and amounts of food materials.		Protein.	Fuel value.
<b>ANIMAL FOOD.</b>			
Beef: Chuck, including shoulder, 16.31 pounds (1); ribs, 10.81 pounds (2); round, 22.06 pounds (3); steak, Hamburg, 9 pounds (11); liver, 7.63 pounds (7); boiled, 9.44 pounds (8); dried, salted, and smoked, 6.69 pounds (13).....	Grams.	Calories.	
Mutton: Leg, 33.69 pounds (17); shoulder, 3 pounds (18).....	23.9	272	
Pork: Chuck, ribs, and shoulder, 18.5 pounds (19); ham, smoked and boiled, 15.44 pounds (24); backs, dry-salted, 16.44 pounds (27).....	9.0	120	
Sausage: Bologna, 5.69 pounds (30).....	10.3	311	
Fish: Cod, salt, 12.13 pounds (37).....	1.5	19	
Eggs, 37.56 pounds (41).....	4.2	15	
Dairy products: Butter, 21.44 pounds (42); milk, 142.38 pounds (44).....	6.1	72	
Gelatin, 0.38 pound (45).....	6.7	371	
Lard, 7.06 pounds (47).....	.5	2	
Total animal food.....	62.2	1,271	
<b>VEGETABLE FOOD.</b>			
Cereals: Cornmeal, granular, 6.56 pounds (50); hominy, 3.54 pounds (51); oats, rolled, boiled, 2.13 pounds (54); rice, 4.81 pounds (55); rice, boiled, 1.13 pounds (56); wheat flour, 9.45 pounds (60); wheat breakfast food, rolled, steam-cooked, 4.81 pounds (62); bread, wheat, 30.25 pounds (66); rolls, 7.38 pounds (58); crackers, soda, 0.69 pound (70); pudding, bread, 2.13 pounds (75).....	22.1	717	
Sugars, etc.: Molasses, 5.25 pounds (77); sugar, granulated, 57.06 pounds (79); sirup, 2.75 pounds (77).....	.3	350	
Vegetables: Asparagus, <sup>a</sup> 1.19 pounds (81); cabbage, 26 pounds (83); lettuce, 4.88 pounds (94); onions, 11.75 pounds (95); potatoes, as purchased, 142 pounds (100); potatoes, edible portion, 7.88 pounds (99); rhubarb, 1.94 pounds (102); rhubarb, stewed, <sup>a</sup> 3.5 pounds (103); spinach, 7 pounds (105); peas, canned, 13 pounds (110); tomatoes, canned, 15.81 pounds (111).....	5.8	185	
Fruits: Bananas, 20.81 pounds (115); lemons, 1.5 pounds (117); oranges, 3.81 pounds <sup>a</sup> (118); strawberries, 14.94 pounds (120); peaches, dried, 5.88 pounds (121); prunes, 7.5 pounds (123); jelly, currant, 11.63 pounds (130); lemon, 0.94 pound (131).....	1.1	120	
Total vegetable food.....	29.3	1,372	
Total food.....	91.5	2,643	
<b>FOOD UNCONSUMED.</b>			
Unused at end of study: Beef and mutton, stewed, 7.13 pounds (138); pork, ribs, cooked, 1.94 pounds (22); fat, 7.19 pounds (46); pie, rhubarb, 1.06 pounds (74).....	1.4	110	
Waste, 114.38 pounds (140).....	7.3	194	
Total food unconsumed.....	8.7	304	
Total food consumed.....	82.8	2,339	

<sup>a</sup> Served only with special sick diet.

#### WASTE.

As is shown in the above table, the total waste during this study amounted to 114 pounds 6 ounces, or 8 per cent of the protein and 7 per cent of the energy of the food supplied. This amount is not large, as compared with that in many other institutions, and is smaller than that in the previous study. This difference is mainly due to the fact that the matron showed remarkably good judgment and tact in the size of portions sent to the rooms, and in this way cut down the amount of food returned uneaten. The waste in this study probably could not have been decreased appreciably, unless possibly in one or two minor ways. A considerable part of the food discarded con-

sisted of meat, which had evidently proved difficult for the elderly men to masticate; if such cuts could have been served in some softer form, such as stews or soups, of which the inmates seemed fond, some waste perhaps could have been prevented. As in many institutions, milk and sugar were added to the tea and coffee before serving. Whether or not this practice is of real economy is an open question which has been discussed in connection with other studies (see p. 20). In the present case it seemed to the observer that the amount of waste was increased rather than diminished thereby.

#### ADEQUACY OF THE DIET.

The amounts of nutrients and energy furnished per man per day in this study were found to be 82.8 grams of protein and 2,339 calories of energy. This amount of protein is two or three grams lower than the standard or the amount found per woman per day in the former study. This difference becomes slightly greater when it is recalled that in all probability the servants and attendants ate more than was credited to them in the calculations, so that the amount actually consumed by inmates was, if anything, lower than that given. The energy supplied is about 140 calories more than the standard. There was little complaint of any kind among the men regarding the character of the food and none whatever regarding the quantity. The natural conclusion therefore is that the standard of 85 grams of protein is abundantly high for men in the decline of life; as for the energy, all that can be safely said is that these men appeared contented and well nourished on an amount slightly higher than the standard.

#### COST AND SELECTION OF FOOD.

The amounts expended for food during the year are given in the report for 1906 as follows: Meats, \$1,380.53; milk, butter, and eggs, \$742.59; poultry, fish, and vegetables, \$766.78; groceries, \$797.25; miscellaneous marketing, \$383.63; giving a total of \$4,070.78. Assuming an average population of 48, the cost per man per week would be \$1.63, or 23 cents per man per day. This amount is the largest found in any of the present studies, and is almost a third again as high as that found in the women's home. The reason for this is by no means apparent. The number of inmates was smaller, but the purchases were more frequently made in bulk, and apparently with better judgment and to better advantage than in the women's home. There may have been fewer donations, necessitating the purchases of more expensive materials, but the list of gifts as published in the annual report hardly sustains this explanation. On the other hand, butter was used only twice a day in this study, and the food consumption is lower, at least as regards the more expensive protein. The reason is

probably to be found, if at all, in the larger proportion of nutrients supplied by meats; in the first study these represent about 33 per cent of the protein and 24 per cent of the energy, while in the second they furnish 49 per cent of the protein and 27 per cent of the energy. Considering that some of the inmates were frequently unable to eat portions of the meat as served and expressed a preference for soups and stews, it would seem easy and desirable to reduce this item, substituting less expensive cuts for the roasts and steaks, or else using more milk and cheese and cereals. In this connection another minor suggestion may be made, namely, that a more frequent use of oatmeal at breakfast would be both acceptable and economical. In spite of these criticisms the fact remains that the diet here studied was well planned, well served, and gave decided satisfaction. An especially agreeable feature was the tact with which the matron succeeded in catering to the individual tastes of the inmates without disturbing the routine of the service or causing ill feeling; this personal consideration was manifested in other ways as well, and undoubtedly did much to produce the contentment noticeable among the inmates. As in the women's home, the conditions of entrance justified the use of a certain amount of luxuries in the diet, and its cost should not be judged by the same standards as that in charitable or penal institutions.

#### DIETARY STUDY NO. 688.

This study was carried on at the German Aged People's Home, in the western part of Baltimore. Although there are no restrictions as to nationality, the home is managed entirely by Germans and the inmates are almost all German. The State grants an annual appropriation of \$1,500, and there are many annual subscriptions from German-American citizens. An admission fee of \$200 is charged, and a considerable part of the annual income is also furnished by the inmates. Both men and women are received. The minimum age for admission is 60 years, but the applications are so numerous that few persons under 65 are admitted. The average number of inmates in 1906 was from 60 to 70; at the time of the study there were 27 men and 38 women.

The home occupies a large, commodious three-story brick building erected in 1885. It is pleasantly situated on a rise of ground, and has about half an acre of land in its rear, devoted to lawns, gardens, and a hen yard. A flock of about 30 hens is kept, being cared for by one of the inmates and fed in part on table waste.

The kitchen, storerooms, and pantry are in the basement, and except for the pantry, which is small and dark, they are large and well furnished. The equipment included a new range and a bread cutter, but few other modern labor-saving devices. A dumb-waiter runs from the kitchen to the dining room on the floor above. The

latter contains two long tables, one for the men and one for the women, and in all their appointments, like everything else at the home, are kept scrupulously clean and neat.

The matron, her assistant, and the five servants, all German, have their meals in a small dining room in the basement, usually before serving the others. Their diet was exactly the same as that given the inmates in the dining room.

Inmates too infirm to come to the main table were served in their rooms. A special sick diet was provided when necessary. During the study there was little real sickness.

Since the close of the study a passenger elevator, screens, a gas range, electric lights and fans, and a steam laundry have been provided. Additional improvements are contemplated.

#### PURCHASE OF FOOD.

The buying was done by the matron, who visited the markets almost daily. She showed good business ability, insisted on good quality, and took great pains to choose wholesome and economical food. A pair of scales was used to check purchases. Little or no food was donated to the home, gifts being made in money instead, a practice probably more satisfactory to the purveyor, as already pointed out.

#### AGE AND WEIGHT OF INMATES.

According to the report of the home for 1906, the average age of the 65 inmates then in the home was 78 years. An opportunity was given to weigh the inmates in the dining room at the close of one meal. The average weight of 18 men was  $141\frac{1}{2}$  pounds; of 29 women, 134 pounds; or an average weight of about 137 pounds for both sexes. Of course the more infirm were not weighed, but their weights would probably not have noticeably changed the average.

The character of the weekly menu is indicated by the menu for one day, which follows.

#### MENU FOR JUNE 5, 1906.

Breakfast: Smoked sausage, bread, butter, coffee with sugar and milk.

Dinner: Barley soup, lamb boiled, string beans, canned tomatoes stewed (left over from day before), potatoes, coffee with milk and sugar, bread.

Supper: Bread, butter, tea with milk and sugar.

#### ATTENDANCE.

Owing to the necessity of finishing the study before the approaching fiftieth anniversary celebration of the home, the usual day of preliminary observation was dispensed with. The study began with dinner on June 2 and continued through 21 meals. During this time 556 meals were served to men and 911 to women. Of the latter, how-

ever, 111 were served to female servants and the matron. As the activity of these women was much greater than that of the male inmates, it seems more reasonable to assume that the greater activity compensated for the difference in sex. The remaining 800 meals to female inmates were as usual assumed to be equivalent to 0.8 of that number for men. The total number of meals as served to male inmates would therefore be  $556 + 111 + (800 \times 0.8 = 640) = 1,307$ . This is equivalent of 1 man for 436 days. The protein and fuel value per man per day are given in the following table:

*Weight of total food and protein and fuel value of food per man per day, dietary study No. 688.*

Kinds and amounts of food materials.		Amounts per man per day.	
Protein.	Fuel value.	Grams.	Calories.
ANIMAL FOOD.			
Beef: Shoulder and clod, 68.94 pounds (6).....		14.1	133
Veal: Leg, 29.75 pounds (14).....		6.4	46
Lamb: Leg, 18.88 pounds (15).....		3.8	46
Pork: Ham, smoked, 36.25 pounds (23); salt, lean ends, 0.88 pound (29).....		6.3	168
Sausage: Frankfort, 14.38 pounds (31); pork, 18.44 pounds (32).....		5.4	128
Fish: Cod, 28.06 pounds (35).....		4.9	22
Eggs, 9.13 pounds (41).....		1.1	13
Dairy products: Butter, 38.69 pounds (42); milk, 224.13 pounds (44).....		8.1	487
Lard, 6.69 pounds (47).....			65
Total animal food.....		50.1	1,108
VEGETABLE FOOD.			
Cereals: Barley, pearled, 1.31 pounds (49); corn meal, granular, 2.69 pounds (50); oats, rolled, 6.63 pounds (53); rice, 6.69 pounds (55); rye flour, 1.63 pounds (58); wheat flour, 129 pounds (60); farina, 1.06 pounds (61); bread, rye, 24.81 pounds (65); macaroni, 5.06 pounds (63); cake, 49.13 pounds (71).....		25.2	885
Sugar, starches, etc.: Molasses, 0.63 pound (77); starch, corn, 0.31 pound (76); sugar, granulated, 50.94 pounds (79); sugar, powdered, 6.38 pounds (80).....			248
Vegetables: Beans, string, 13.63 pounds (82); cabbage, 26.13 pounds (84); cabbage, boiled, 5.94 pounds (85); leeks, 1.56 pounds (93); lettuce, 7.06 pounds (94); onions, 6.81 pounds (96); potatoes, 198.38 pounds (99); corn, canned, 2.06 pounds (109); tomatoes, canned, 22.75 pounds (111); pickles, cucumber, 0.25 pound (114).....		6.0	205
Fruits: Lemons, 1.56 pounds (117); strawberries, 26.63 pounds (120); grapes, preserved, 0.75 pound (128); pears, canned, 26 pounds (127).....		.4	35
Beer, <sup>a</sup> 6 pounds (134).....			3
Olive oil, 0.63 pound (135).....			6
Total vegetable food.....		31.6	1,382
Total food.....		81.7	2,490
FOOD UNCONSUMED.			
Food unused at end of study: Ham, smoked and boiled, 1.44 pounds (24); codfish cakes, 0.50 pound (137); fat, 5.19 pound (46); bread, 11.31 pounds (66); noodles, 2.06 pounds (63).....		1.9	93
Waste: Bread, 1.63 pounds (66); table waste, 148.50 pounds (142); kitchen waste, 79.13 pounds (141).....		6.3	172
Total food unconsumed.....		8.2	265
Total food consumed.....		73.5	2,225

<sup>a</sup> A donation sufficient in amount for only a portion of the inmates.

#### WASTE.

The food wasted in this study was weighed in three forms: (1) A lot of bread weighing 1 pound 10 ounces thrown away as too dry to

use; (2) table waste weighing 148 pounds 8 ounces; and (3) kitchen waste weighing 79 pounds 2 ounces. The protein and energy wasted was only about 7 per cent of the total, a very creditable showing.

Most of the waste seemed unavoidable. Of course the bread could have been utilized if attended to in time, but this was a very small item and there is no reason to suppose it other than an accidental occurrence. On the whole, very great pains were evidently taken to reduce the waste to a minimum, and, as the data show, with commendable success. It should also be noted that the waste in this home was not thrown away as garbage, but used as food for the flock of hens and incidentally gave some return in this way.

On the other hand, there existed another probable source of waste which could not be measured. It was the custom to allow the inmates to take tea and coffee to which milk and sugar had been added to their rooms to be consumed when desired. Occasionally inmates were seen to take other foods from the table for the same purpose. It is not reasonable to suppose that all of this food was eaten. At the same time the waste was probably greater in bulk than in nutrients, as the tea and coffee contained only small amounts of actual food. While it could easily have been avoided altogether by doing away with the practice, it is a question for the management to decide whether or not this would be wise. The custom is said to be in accordance with the habits of many of the inmates prior to admission to the home and its abolition might arouse discontent. Quite likely the slight loss was justified as a means of making the inmates more contented. It is interesting to note that in Swedish old-age homes<sup>a</sup> it is the custom to allow the inmates to prepare their own breakfast (coffee and bread) and their afternoon coffee in their rooms, a practice in accord with their usual habits, and believed to contribute to their contentment and comfort without adding materially to the expense of the institution.

#### ADEQUACY OF THE DIET.

According to the table (p. 61) the protein and fuel value of the food actually eaten per male inmate per day during this study was 73.5 grams of protein and 2,225 calories of energy. This amount of energy is practically identical with the standard, 2,200 calories, but the protein is over 10 grams lower than the 85 grams which the standard calls for. Since in the calculations of this study the female inmates are considered as consuming only 0.8 of the food consumed by the males, and since it is doubtful whether in extreme age the food consumption of the sexes differs as much as this implies, the figures here, if they err at all, are too large rather than too small. Nevertheless, bearing the extreme age and light weight of the inmates in mind,

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<sup>a</sup> Littell's Living Age, 7. ser., 17 (1902), p. 473.

it does not necessarily follow that the diet was inadequate, even as regards protein. They were not restricted as to the amount of food eaten at table and could have increased it had they wished. Moreover, many of them seemed to have private sources of supply through individual purchase or gifts. The observer several times noticed inmates bringing in food, and the table waste during the study contained 10 ounces of prunes, an orange, and several ounces of pretzels, none of which were provided by the home. It was of course quite impossible to estimate the amount of food thus obtained, but probably it introduced no large error, especially as it seemed to consist mainly of succulent fruits and other materials of low nutritive value in proportion to their bulk. Just as in the previous studies, it may have been simply the desire for variety which prompted the inmates to procure such extra food; nevertheless its existence must be considered in discussing the adequacy of the diet. But even making allowance for it, this study, like that in the aged men's home, suggests that persons in extreme age can be comfortably nourished on less protein than the 85 grams indicated by the standard.

#### COST AND SELECTION OF FOOD.

According to the report of the home for 1906, the cost of food materials for that year was \$3,016.45, and the number of inmates and attendants about 70, making the average cost per person about 83 cents a week, or about 12 cents a day. The institution is to be congratulated upon its judicious expenditure; the cost was only about half as great as in the aged women's home and aged men's home, and this in spite of the fact that the German home received few gifts of food. The amount of nutrients provided was somewhat less, but the inmates seemed contented and well nourished. Unless one is to question the advisability of so low a protein supply, which would seem, however, entirely adequate for aged persons with little or no activity, criticism is useless in the face of so good a showing. Two or three peculiar features of the management may, however, be of interest to those having charge of similar dietaries.

The menus for the week showed that the suppers were very simple and lacking in variety, while the dinners were much more varied. This is said to be in accordance with a common German custom. No butter was served at noon except on Sunday. A peculiar system was in vogue as to vegetables; a larger quantity than was necessary for a single meal was cooked, and the surplus warmed over on the following day and served in smaller quantities. By following this custom two vegetables were obtained for each dinner, although but one had really been purchased for that meal. This permitted greater catering to individual tastes than would otherwise have been the case, and was appreciated by the inmates.

## DIETARY STUDY NO. 689.

This study was made at the Maryland Home for Friendless Colored Children. During the year 1906 the institution received \$1,065.40 from the city of Baltimore and \$500 from the State of Maryland. There was a further very small income from board paid by a few children. Considerable dissatisfaction had been expressed by the city board of charities regarding the management of the home and radical changes had just been made to avoid the loss of the city appropriation. It had been very recently moved from a less desirable part of the city to its present location, and its policy had been altered. It had formerly received both boys and girls, but henceforth was to receive boys only. At the time of the study there were still 2 girls, who were to be removed as soon as desirable arrangements could be made, and 23 boys. The ages of the children ranged from 3 to 13 years. The care of the home and children was in the hands of a matron and two assistants, all colored. Definite information on some points was difficult to obtain, as the institution published no report.

The building was a well-located, three-story brick house, part of a city block, and large enough to accommodate from 20 to 30 children. There was a small yard in the rear. The dining room was a dark, back room only 12 feet square; into this were crowded two tables, seating, respectively, 12 and 13 children, a smaller one for the matron, and a refrigerator. The kitchen was immediately behind the dining room and contained few conveniences.

## PURVEYING OF FOOD.

The institution depended for its food largely upon donations, which came in very irregularly. The staple food was stale bread, which was secured each day from local bakers. The materials which were bought were obtained rather at haphazard. Some foods were purchased in very small quantities—for instance, potatoes, on one occasion, were bought by the quart. On the other hand, a 200-pound bag of salt was found in the pantry, and both granulated and brown sugar were bought by the barrel, although very little of the granulated was used. Corned beef, bacon, hominy, and flour were also purchased in large quantities. There were considerable donations of cake, cookies, pies, and occasionally fruit. It may be noted that the tea served at all the tables was very weak, 1 teaspoonful of leaves sufficing for a meal. Most of the 15 quarts of milk used during the week were mixed with the tea. In general, it may be said that no systematic attention was given to the food supply, although a weekly menu was found posted in the kitchen, presumably as a guide in serving meals.

## KINDS OF DIET.

The matron and her assistants ate at the same time as the children, but had a much more varied diet, including considerably more meat, vegetables, and fruit. These items are separately listed in the table (p. 67) and include the greater part of the materials purchased. One of the children was ill with measles during the study and received a special diet for most of the week.

## AGE, WEIGHT, AND PHYSICAL CONDITION OF CHILDREN.

The following table gives the statistics gathered on these points. The only scales available for weighing the children were in a penny-in-the-slot machine near by. Several rough tests of the accuracy of this were made which indicated that its readings were reasonably correct, and the weights here given are considered fairly reliable.

*Ages and weights of negro orphans.*

Subject.	Age.	Weight.	Subject.	Age.	Weight.
	Years.	Pounds.		Years.	Pounds.
Boy.....	3	39	Boy.....	10	56
Do.....	3	41	Do.....	10	58
Do.....	5	38	Do.....	10	75
Do.....	5	41	Do.....	10	76
Girl (probably tuberculous).....	6	37	Do.....	10	78
Boy.....	7	48	Do.....	11	70
Girl.....	7	54	Do.....	11	74
Boy.....	8	45	Do.....	11	77
Do.....	9	54	Do.....	12	68
Do.....	9	56	Do.....	12	85
Do.....	9	56	Boy (only one leg).....	13	68
Boy (probably tuberculous).....	9	50	Average.....	8.7	58.6
Boy.....	9	62			

These figures seem slightly below the average for children of the respective ages, but the difference is not marked, especially in the older boys. The table of weights for different ages, as given by one of the large life insurance companies, is as follows:

*Average weight of boys and girls at different ages, as shown by insurance statistics.*

Subject.	Age.	Weight.	
		Boy.	Girl.
	Years.	Pounds.	Pounds.
Child.....	5	45	40
Do.....	6	50	43
Do.....	7	55	47
Do.....	8	57	52
Do.....	9	62	57
Do.....	10	67	62
Do.....	11	72	69
Do.....	12	78	78
Do.....	13	85	89

It should be said in this connection that probably the figures in the second table apply to children with more or heavier clothing. The orphans here studied went barefooted, and the clothing of the boys consisted simply of a shirt and pair of trousers. This would probably make a difference of at least 1 or 2 pounds in the weight.

In general, the children seemed in good health and spirits and showed little sign of underfeeding. Two, however, were in delicate health and seemed to the observer to be suffering from tuberculosis.

The following menu for one day, June 17, gives an idea of the kind of meals served.

MENU FOR WEDNESDAY, JUNE 17, 1906.

Breakfast: Bread, rolled oats, milk, brown sugar.

Dinner: Bread, corned beef, green peas, boiled cabbage.

Supper: Bread, molasses, brown sugar, cookies.

ATTENDANCE.

The study began with supper on June 14, after a preliminary observation of half a day, and continued through 21 meals. The total attendance for the week was 483 meals for boys, 42 for girls, and 62 for the matron and attendants. As has been pointed out, the diet at the matron's table was made up in part of that eaten by the children, but supplemented to a very large extent by additional materials. It is believed to be a fair assumption that the matron and her assistants ate the same amount of the regular diet as did the children and that the amounts of additional foods may be considered as compensating for the difference in age and activity. The girls were so young that it is not believed that their food consumption need be estimated separately from that of the boys. In other words, the entire attendance, 587 meals, equivalent to 1 child for 196 days, may be considered as the basis for computing the amounts "per child per day."

A means of verifying this assumption, however, is afforded by the supplementary list of foods eaten at the matron's table, as given at the end of the table on page 67. The nutrients in this, when divided by 3, the total number of women receiving these foods, and added to the amounts of protein and energy supplied per child per day give a total of 93.7 grams protein and 2,495 calories of energy, an ample ration for a woman at light to moderate muscular work.

*Weight of total food and protein and fuel value of food per child per day,  
dietary study No. 689.*

Kind and weight of food materials.	Amounts per child per day.	
	Protein.	Fuel value.
<b>ANIMAL FOOD.</b>		
Beef: Shoulder and clod, 5.13 pounds (6); corned, 10.38 pounds (12).....	Grams.	Calories.
Pork: Backs, dry-salted, 5.63 pounds (27).....	6.1	95
Fowl, 5 pounds (34).....	1.0	92
Eggs, 2.81 pounds (41).....	2.2	27
Dairy products: Butter, 2.13 pounds (42); milk, 29.50 pounds (44).....	.8	9
Lard, 2.75 pounds (47).....	2.3	88
		59
Total animal food.....	12.4	370
<b>VEGETABLE FOOD.</b>		
Cereals: Hominy, 4.75 pounds (51), boiled, 3.13 pounds (52); oats, rolled, 4 pounds (53); rice, boiled, 3.75 pounds (56); wheat flour, 11.69 pounds (60); biscuit, Maryland, 10.56 pounds (67); bread, white, 124.94 pounds (66); rolls, 1.44 pounds (68); cake, baker's, 10.31 pounds (72); frosted, 1.13 pounds (73); pie, rhubarb, 2.25 pounds (74).....	36.7	1,154
Sugar, etc.: Molasses, 7.88 pounds (77); sugar, brown, 11.56 pounds (78).....	.4	156
Vegetables: Cabbage sprouts, 2 pounds (86); carrots, 0.63 pound (87); carrot tops, 2.19 pounds (88); onions, 0.38 pound (95); peas, green, 1.13 pounds (98); potatoes, 4.44 pounds (99); potatoes, boiled, 5.25 pounds (101); rhubarb, 3.63 pounds (102); squash, 7.06 pounds (106); tomatoes, canned, 2.13 pounds (111).....	1.4	41
Total vegetable food.....	38.5	1,351
Total food.....	50.9	1,721
<b>WASTE.</b>		
Table and kitchen waste, 3.19 pounds (143).....	.4	11
Soup, 15.25 pounds (136).....	.3	33
Total waste.....	.7	44
Total food consumed.....	50.2	1,677
<b>SPECIAL FOOD SERVED AT MATRON'S TABLE.</b>		
Animal food: Beef, round, 4.69 pounds (4); lamb, leg, 2.50 pounds (16); pork, loin, 1 pound (21); pigs' feet, pickled, 1.38 pounds (28).....	39.0	503
Vegetable food: Macaroni, 0.88 pound (63); rice, flaked, 0.19 pound (57); sugar, granulated, 1.69 pounds (79); cucumbers, 0.56 pound (90); leeks, 1.50 pounds (93); lettuce, 0.38 pound (94); tomatoes, 0.88 pound (107); bananas, 3.38 pounds (115); blackberries, 1.25 pounds (116).....	4.5	315
Total special food per woman per day <sup>a</sup> .....	43.5	818
Total food per woman per day <sup>a</sup> .....	93.7	2,495

<sup>a</sup> See page 65.

**WASTE.**

The normal waste in this home was very small, amounting for the whole week to only 3 pounds 3 ounces. In fact, it proved easier to save and analyze all the waste than to sample it. The greater part, indeed, came from the matron's table; there was rarely anything but a few crumbs discarded by the children, and the kitchen waste consisted largely of the ends of loaves of bread.

Besides this usual waste, however, there were two losses due to negligence. The first was in the case of fresh cabbage, which was kept so long that the outer leaves had to be discarded. This was included with the regular waste. The second case was more notice-

able. About 35 pounds of chicken bones, from which most of the meat had been removed for salad, was donated by a caterer. A portion of this was given to the children immediately, but the remainder was made into soup and doled out gradually. Part of this was kept until it became unfit for food, and 15.4 pounds had to be thrown away. This of course involved a waste of the other materials in the soup as well as of the chicken itself. Even so, some soup was eaten after it had spoiled, and several of the children were made ill by it.

#### ADEQUACY OF THE DIET.

This topic will be discussed at length in a later section (see p. 87). Suffice it here to say that as compared with the dietary standard usually accepted in this country, the daily supply of protein, 50.2 grams, and the fuel value of the daily food, 1,677 calories, are both a trifle low. It may well be, however, that an investigation of the diet at another time would have found it more generous.

As was previously stated, most of the children had the appearance of fair health. They were always eager for more to eat, a boy on one occasion even eating the crumbs of table waste which had been gathered up after the meal, but such a state of things is too common among children generally to be of great significance. The children were forbidden to get food of any kind outside of the home, and it is not probable that they often obtained anything except a very little candy in this way. Judging from their rather low weights, they were none too well nourished. If we accept the general belief that an abundant diet, especially as regards protein, is necessary for the best development of a growing child, then the protein supply as shown by the period of the present study must be considered somewhat too low for the best results.

#### COST AND SELECTION OF FOOD.

No data are available as to the cost of this diet, but as it was practically all donated, the cash expenditure must have been very small. Since the orphans were fed so largely on whatever was available, discussion of its improvement seems futile. The question of the extent to which charitable institutions should solicit or even accept gifts of food, however, is a very broad one. After all, this home was merely an extreme type of what took place to a limited degree in all the Baltimore homes visited except the German Aged People's Home. Probably to a certain extent the system may be justified. So long, however, as people continue to give away what is of little value to themselves we should not expect foods of the best quality or suitability to be thus provided. An institution supplied with the equivalent in money would be able to expend its funds to much better advantage and in

addition be in a position to provide a systematic and well-ordered diet such as can not be obtained when the food supply is so largely the result of chance.

#### DIETARY STUDY NO. 690.

The last study of the series was made at the German Orphan Asylum (Allgemeines Deutsches Waisenhaus), a charitable institution in the northeastern part of Baltimore. It had a small endowment and receives \$1,500 a year from the State, but was chiefly supported by the subscriptions of German-American residents of the city, from whom the board of management was also drawn. Although there were no restrictions as to the nationality of the orphans admitted, they were almost exclusively of German parentage. The immediate supervision of the asylum and children was in the hands of a superintendent and of his wife, who served as matron, and three teachers. A baker, a tailor, a shoemaker, and a cook, all Germans, were also employed, but the greater part of the housework was done by the older girls.

The neighborhood in which the asylum is located was a good one when the institution was established, about thirty years ago. It had recently, however, become very crowded and undesirable, and the management contemplated removing the asylum to the suburbs. The building was a large, detached four-story brick structure, with about an acre of playground in the rear. The house accommodated 165 children, and that number was enrolled at the time of the study, though about 40 of the youngest had been sent to a branch home in the country for the summer. The extensive storerooms and the bakery where the bread and pastry are made were in the basement. The general kitchen was a good-sized room on the first floor, and was equipped with a large modern range and many improved labor-saving devices. The main dining room, adjoining the kitchen, was a large, well-lighted room, with five long tables, seating from 11 to 36 children each. The tables and dining room floor were scrubbed after each meal. Meal hours for the children were 7.30 a. m., 12.15 p. m., and 6 p. m.

#### PURVEYING OF FOOD.

Particular attention was given in this institution to buying materials in bulk, and cereals, canned goods, apple butter, sirup, sugar, sauerkraut, potatoes, etc., were always obtained in that way. The food purchased was of good quality. The only dissatisfaction during the study was caused by the milk, which was obtained direct from a farmer; it did not keep well and was suspected to be of poor quality. The question was referred to an inspector of the city health department, who took samples for analysis. Besides the food purchased, the

asylum received frequent gifts of meats, bread, cake, vegetables, and fruit. There is no means of knowing how large a proportion of the diet during the study was obtained in this way. Shrewd management and good business judgment were everywhere manifested in this home, as were also neatness and thrift.

#### KINDS OF DIET.

Four different diets were served during this study: (1) The superintendent's private table, at which meals were served to all the adults and the superintendent's two children immediately before the orphans were served. Special meats and vegetables were always provided for this table, though not necessarily more expensive kinds. The other foods were mainly of the same kind as those for the regular table. Articles used exclusively for this table are so designated in the table (p. 73). (2) Working girls' table, for the 11 oldest girls, who had regular household duties. Their fare consisted of the regular diet, supplemented at dinner by coffee, with milk and sugar, and at supper by fried potatoes and some kind of meat, usually cold. (3) Table for children under 8 years old, of whom there were only six at the time of the study. They had the regular diet, with milk at each meal, and no tea or coffee. (4) Regular table for all other children. A sample menu of this group for the week studied is given on page 71.

#### AGE, WEIGHT, AND PHYSICAL CONDITION OF CHILDREN.

The statistics regarding the age and weight of the boys and girls in the asylum are shown in the following table:

*Age and weight of children, dietary study No. 690.*

Age of children. <sup>a</sup>	Number of boys.	Average weight of boys.	Number of girls.	Average weight of girls.
Years.		Pounds.		Pounds.
4.....	1	31.0	.....	.....
5.....	1	37.0	.....	.....
6.....	.....	.....	.....	.....
7.....	1	43.0	3	42.7
8.....	3	48.0	2	54.5
9.....	3	49.3	9	51.9
10.....	6	51.5	6	52.7
11.....	8	51.9	7	61.0
12.....	10	61.4	3	64.7
13.....	17	64.4	6	74.3
14.....	7	70.3	4	93.7
15.....	1	107.0	6	99.7
16.....	.....	.....	7	105.6
17.....	.....	.....	4	109.5
Total.....	58	.....	57	.....
Average.....	.....	59.2	.....	74.3

<sup>a</sup> Average age: Boys, 11.5; girls, 12.2 years.

Comparison with the figures published by one of the large life insurance companies and with the weights of negro children in the

preceding study (see p. 65) shows that while these children weighed a little more than the negro orphans their weights were considerably lower than those given by the insurance company. It should be remembered that these studies were made in June, in a warm climate, and the clothing worn would probably weigh considerably less than that of the average child under other circumstances. Low weights were more noticeable among the boys than the girls, and especially among the older boys. The observer was surprised to learn the ages of the larger boys, as he had supposed them well-developed boys several years younger than they actually were. The low weight among those over 12 years of age may be partly explained by the fact that after reaching that age the boys were frequently apprenticed, and those remaining in the asylum would represent the least robust. In general, the children appeared in excellent health, and the institution had an unusually good record in this respect. During the week of the study there was but one case of sickness among 120 children, and in the fifteen years in which the superintendent had been in charge there had been but three deaths in the asylum.

The following menu for one day is given as a sample of the diet served at the regular table during the study:

#### MENU FOR JUNE 23, 1906.

Breakfast: Bread, with apple butter, coffee, and rolled oats with milk and sugar.

Dinner: Bread, rice boiled, potatoes boiled, prunes stewed.

Supper: Bologna sausage, bread, tea with milk and sugar.

#### ATTENDANCE.

On account of the necessity of completing the study before June 30, the end of the fiscal year, the preliminary period of observation was omitted. The study began with dinner on June 22 and was continued through 21 meals. The number of meals served during this time was: To men, 89; to women, 121; to girls, 1,181; to boys, 1,208, a total of 210 to adults and 2,389 to children.

The computation of the amounts eaten per person per day in this study is somewhat complex, as the population included adults and children of both sexes and of various ages and duties. The men, namely, a superintendent, baker, tailor, and shoemaker, all assisted in looking after the boys at various times, in addition to their other duties. The women were the matron, the aged mother of the superintendent, the cook, and three teachers. The older boys were being taught baking, tailoring, and shoe repairing in the home, and the older girls were quite actively engaged in the kitchen and laundry. The younger children attended school when in session, but at the time the study was made it was vacation and they had no regular

duties. Further, as has been already explained, four different diets were served regularly (see p. 70).

Two special difficulties were also encountered. The first was the absence of 74 children and 2 teachers from dinner on the sixth day of the study, because of a picnic. A lunch of sandwiches of cheese and cold ham and beef, and rolls, was prepared at the home and taken along; hence it could not be assumed that the picnickers were absent from any meals. Many of them, however, bought, in addition to this lunch, peanuts, popcorn, ice cream, etc., in unknown amounts, so that while the sandwiches could not have been equivalent to the dinner usually served, the appetites of these children were noticed to be very small at supper and much less than the usual amount of food was eaten at that time.

The second difficulty was encountered on the day following, which was the monthly visiting day. On this occasion it is the custom for relatives and friends to bring to the individual children fancy cookies, cake, fruit, etc., and the total amount thus brought in was quite considerable. In the opinion of the observer each child must have had at least the equivalent of one banana and one cookie, although owing to the varied character of the gifts the exact kind and amount could not be ascertained. It seems, however, safe to assume that this error and the one due to the picnic together make the equivalent of perhaps one meal for each child, but it was not deemed wise to regard this in the calculations. In view of all the sources of uncertainty, the accuracy of this study is probably not so great as that of the others, and this must be kept in mind in drawing deductions from the work.

An attempt has been made to make the calculations in two ways, so that each may act as a check on the other. To obtain the figures given in the table on page 73 it was assumed that the food consumption of the adults was 1.5 that of the children; the number of meals for adults, 210, was multiplied by 1.5, making 315, which, added to those for children, 2,389, gives a total of 2,704, equivalent to 1 child for 901 days. This method assumes that the adults were at light to moderate muscular work, and that the children were from 10 to 12 years of age.<sup>a</sup> While the figures are not absolutely accurate, the error introduced can not be large.

As a check to these calculations the total amount of protein and energy consumed during the entire week by the whole population (58,700 grams of protein and 1,620,700 calories of energy) was taken and from this were deducted the amounts eaten by the adults, assuming that each man consumed 112 grams protein and 3,050 calories of energy, and each woman 90 grams protein and 2,450 calories of energy per day.<sup>b</sup> As there were 89 meals for men, or 1

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<sup>a</sup> U. S. Dept. Agr., Farmers' Bul. 142, p. 33.

<sup>b</sup> U. S. Dept. Agr., Farmers' Bul. 142, p. 35.

man for thirty days, and 121 for women, or 1 woman for forty days, these amounts are 3,360 grams protein and 91,500 calories of energy, plus 3,600 grams protein and 98,000 calories of energy, or a total of 6,960 grams protein and 189,500 calories of energy. The results obtained after this subtraction were divided by 796 (or  $2,389 \div 3$ ), which is the equivalent number of food days for 1 child. This second calculation gives the amounts consumed per child per day as 65 grams of protein and 1,798 calories of energy, practically identical with the 65.1 grams of protein and 1,798 calories of energy obtained by the first method.

*Weight of total food, and protein and fuel value of food per child per day,  
dietary study No. 690.*

Kind and weight of food materials.	Amounts per child per day.	
	Protein.	Fuel value.
<b>ANIMAL FOOD.</b>		
Beef: Ribs, 22.50 pounds (2); roast, <sup>a</sup> 0.69 pound (9); rump, <sup>a</sup> 12.19 pounds (5); shoulder and clod, 45.75 pounds (6); steak, Hamburg, <sup>a</sup> 9.63 pounds (11).....	Grams. 8.8	Calories. 119
Veal, leg, 27.69 pounds (14).....	2.9	21
Mutton, leg, 10 pounds (17).....	.9	12
Pork: Rib, 30 pounds (19); side, cooked, <sup>a</sup> 0.56 pound (22); ham, smoked, salted, and boiled, 18.88 pounds (24).....	4.6	83
Sausage: Bologna, 20 pounds (30); liver, 15.56 pounds (32).....	2.8	47
Eggs, 15.13 pounds (41).....	.9	11
Dairy products: Butter, 7 pounds (42); cheese, full cream, 10.38 pounds (43); milk, 650.63 pounds (44).....	12.2	285
Lard, 15.44 pounds (47).....		72
Total animal food.....	33.1	650
<b>VEGETABLE FOOD.</b>		
Cereals: Barley, pearled, 9.25 pounds (49); oats, rolled, 31.50 pounds (53); rice, 15 pounds (55); wheat flour, 299.56 pounds (60); bread, wheat, 139 pounds (66); bread, wheat and rye, 16.25 pounds (69); cake, bakers', <sup>a</sup> 1 pound (72).....	27.3	868
Sugars: Brown, 30.50 pounds (78); granulated, 39.50 pounds (7).....		141
Vegetables: Beans, string, <sup>a</sup> 2.56 pounds (82); beets, <sup>a</sup> 3.63 pounds (83); cabbage, 41.88 pounds (84); cabbage, boiled, 7.56 pounds (85); cucumbers, <sup>a</sup> 3.13 pounds (89); kohlrabi, <sup>a</sup> 3.88 pounds (92); lettuce, <sup>a</sup> 3.25 pounds (94); onions, <sup>a</sup> 1.19 pounds (96); peas, dried, 20.50 pounds (97); potatoes, 126.69 pounds (99); rhubarb, <sup>a</sup> 2.25 pounds (101); sauerkraut, 14.06 pounds (104); beans, baked and canned, 50.25 pounds (108); beans, string, pickled, 17.25 pounds (112).....	6.5	140
Fruit: Lemons, <sup>a</sup> 1.75 pounds (117); pineapple, <sup>a</sup> 8.25 pounds (119); prunes, 10.31 pounds (123); peaches, canned, 6.13 pounds (126); jelly, currant, 13.38 pounds (130).....	.2	36
Apple butter, 19.94 pounds (133).....	.1	11
Bear, 11 pounds (134).....		11
Olive oil, <sup>a</sup> 2.38 pounds (135).....		3
Total vegetable food.....	34.1	1,210
Total food.....	67.2	1,860
<b>FOOD UNCONSUMED.</b>		
Food unused at end of study: Beef, rump, cooked, 1.50 pounds (10); fat, 1 pound (46); beets, pickled, 1 pound (113).....	.2	7
Waste, 104.44 pounds (144).....	1.9	55
Total food unconsumed.....	2.1	62
Total food consumed.....	65.1	1,798

<sup>a</sup> Served only at superintendent's table.

## WASTE.

The total amount of food wasted in this study was 104 pounds 7 ounces, containing about 3 per cent of the total protein and energy of the food. This proportion is very small, especially when it is remembered that the subjects were children, and it is well known that children often show a tendency to leave food uneaten. In the present study this rarely occurred. This may be partly explained by the rule requiring them to eat whatever they took on their plates, but the observer noticed furthermore that very little food was returned from the dining room to the kitchen from the large dishes in which it was served, or, in other words, that the total amount served at each table was consumed. Exceedingly good judgment as to the amount likely to be eaten probably explains this. Moreover, the fact that on the evening of the picnic and visiting days, when the appetite had been satisfied by extra food, food was left both on the serving and individual plates affords a strong corroboration of the supposition.

All waste from the plates was thrown away as garbage. When surplus meats and similar materials remained in the serving dishes, they were utilized at the table of the larger girls. In general, efforts to reduce waste of every sort were manifest.

## ADEQUACY OF THE DIET.

In spite of the discrepancies discussed above, the amounts per child per day given in the table (p. 73) are probably sufficiently correct to be used as a general basis of discussion, which will be given beyond (see p. 87).

It may be briefly stated here that the protein and energy of the diet were about equal to those suggested by the commonly accepted standard for boys of 11 and girls of 12 years of age, whereas the children's ages averaged a few months higher. When we consider that on the average they were under normal weight, it becomes a question whether a slightly more liberal diet would not be desirable. At the same time it must be admitted that the children appeared healthy and comfortable on the food supplied.

## COST AND SELECTION OF FOOD.

The report of the asylum for the year 1906 gives the cost of food as \$4,462.59 and the number of children as 153, indicating an average cost of 56 cents per child per week, or 8 cents a day. Many of the materials used were donated, especially the more expensive kinds, so that these figures do not represent the actual cost of the total food used. It is impossible to say how much should be added for the donations, but it must certainly be a noticeable amount. Even making due allowance for this, there is every reason to believe that the

money spent for food was not at all excessive and brought a good return to the institution.

As in the German Aged People's Home, the breakfasts and suppers were very plain and monotonous, and the dinners much more varied, and this arrangement, while not in accord with the usual custom in this country, seemed acceptable to the inmates and is said to be in accord with German custom. Aside from this point, the diet in this asylum had no striking features and seemed chosen with economy and wisdom.

## THE DIETARY STUDIES WITH THE AGED AND THEIR RESULTS.

### DIETARY REQUIREMENTS OF THE AGED.

Temperament and other factors undoubtedly have an effect upon the amounts of food consumed by individuals, but, considering average values and uniform body weight, it is generally conceded that the most important factors in determining food requirements are age, sex, and muscular activity. The commonly accepted American dietary standards assume that a woman requires eight-tenths as much protein and energy as a man performing a like amount of muscular work of the same degree of intensity; that children require smaller quantities than adults; that their requirements increase until they are fully grown; and, in general, that food requirements are directly dependent upon the amount of muscular work performed. Data regarding the effects of age have been limited, and the standards referred to have not given factors for middle life and old age, though it is generally recognized that after man has reached maturity and the development of his powers there is a natural physical decline, and many writers on dietetics have insisted that there is a corresponding decline in food requirements.

The literature regarding the relations of old age to tissue metabolism, cell activity, and related topics is fairly large, but no attempt is made to review it thoroughly here. Some of the more interesting studies, however, will be briefly referred to in the following paragraphs and their results given in the table on page 83.

Cornaro, an Italian who published a treatise on the subject in the sixteenth century, is often cited as an example of the advantages to be derived from a diet simple in character and restricted in amount. According to his own statement,<sup>a</sup> when 35 to 40 years of age, he became very ill as a result of excesses of all kinds and was advised by his physicians to change his habits and to observe great moderation in food, drink, and all things. After more or less experimenting with foods and drinks to ascertain whether those which pleased the palate

<sup>a</sup>A Treatise of Temperance and Sobrietie. Translated by G. Herbert. [First Italian edition appeared in 1558.]

also agreed with him, he gave up his former excesses and regained his health, living a regular life for many years. He paid great attention to exercise in the open air, to sleep, to wholesome pleasures, and all other things which make for health as much as does diet. In his first essay, written when he was 83 years old, he gives some details regarding his food habits, stating that when 78 or 79 his daily fare consisted of 12 ounces of bread, egg yolk, broth and meat, and 12 ounces of wine. Whether these amounts are the same as he consumed when younger is not stated. However, in one of his essays he says that as he advanced in years and lost strength he felt that he should lessen rather than increase the quantity of food eaten, so it is not improbable that his diet in the years immediately following the change in his manner of living was more generous than in old age. In speaking of the foods which he used when 86 years of age, Cornaro mentions veal, kid, mutton, eggs, bread, porridge, broth, chicken and other poultry, wild birds, and fish, but there is nothing said of the amounts eaten. The fact is so clearly recognized by Cornaro that food requirements diminish as a person grows old that it seems fair to conclude that he modified his diet in accordance with this view and that his experience may be regarded as an excellent illustration of the advantage of great moderation in advancing years.

Lessius,<sup>a</sup> a writer on dietetics of a little later date than Cornaro, expresses very similar views regarding food requirements in later life. He states clearly that labor very largely determines the food requirements for persons of like age, and that old persons require smaller amounts than the young or middle aged. In his opinion, the diet of the aged should consist of bread, meat, eggs, and such foods, the total daily quantity ranging from 12 to 14 ounces. Other early writers could be cited in support of this belief.

Most of the recent writers, including such authorities as Voit,<sup>b</sup> Munk and Ewald,<sup>c</sup> and Sir Henry Thompson,<sup>d</sup> may be cited in support of the theory that those who have passed middle life do not require as much food as the young.

Sir Henry Thompson sums up the matter thus:

As we increase in age—when we have spent, say, our first half century—less energy and activity remain, and less expenditure can be made; less power to eliminate is possible at 50 than at 30, still less at 60 and upward. Less nutriment, therefore, must be taken in proportion as age advances, or rather as activity diminishes, or the individual will suffer. If he continues to consume

<sup>a</sup> *Hygrasticon, or the Right Course of Preserving Life and Health unto Extreme Old Age.* Cambridge, 1634.

<sup>b</sup> *Ztschr. Biol.*, 12 (1876), p. 32.

<sup>c</sup> *Ernährung des gesunden und kranken Menschen.* Vienna and Leipsic, 1895, pp. 72, 214.

<sup>d</sup> *Diet in Relation to Age and Activity.* London and New York, 1902.

the same abundant breakfasts, substantial lunches, and heavy dinners, which at the summit of his power he could dispose of almost with impunity, he will in time certainly either accumulate fat or become acquainted with gout or rheumatism, or show signs of unhealthy deposit of some kind in some part of the body \* \* \* which must inevitably empoison, undermine, or shorten his remaining term of life. He must reduce his "intake," because a smaller expenditure is an enforced condition of existence. At 70 the man's power has further diminished and the nutriment must correspond thereto, if he desires still another term of comfortable life. And why should he not? Then at 80, with less activity, there must be still less "support."

Moderation is the keynote of the advice which he gives regarding diet suited to middle life and old age.

The great practical rule of life in regard to human diet will not be found in enforcing limitation of the sources of food which nature has abundantly provided. On the contrary, that rule is fulfilled in perfect development of the art of adapting food of any and every kind to the needs of the body according to the very varied circumstances of the individual, at different ages, with different forms of activity, with different inherent personal peculiarities, and with different environments.

He conformed his own habits to his beliefs regarding moderation in diet and in all things, and lived to be over 80 years of age. Special attention was paid to moderate exercise in the open air and to other matters of hygiene. He advises a dietary system which he states can be varied according to the idiosyncrasies of the individual. This includes four small meals per day, namely, breakfast about 8.30, luncheon at about 1, dinner at 7, and a light supper at about 11. The animal food recommended for breakfast and luncheon includes egg or fish. A little meat or fowl may be taken at luncheon, unless it is preferred to reserve them for dinner, in which case fish and a farinaceous pudding may be substituted. The dinner he recommends includes a little consommé, purée of fish or soup, and a little fowl or game, with a dish of vegetables, and finally some light farinaceous pudding with or without fruit. The supper late in the evening, which is considered to promote sleep, consists of 4 or 5 ounces of consommé with an ounce of thin toasted bread. For all meals the bread, whether whole wheat or white, in the opinion of the writer cited, should be thoroughly toasted, a quantity weighing 3 to 5 ounces before toasting being sufficient for a meal. Butter also forms a part of the meals, 3 or 4 ounces being thought desirable daily, including that which is used in the cooking. Weak tea or coffee with milk and aerated distilled water are recommended as beverages.

It is perhaps hardly fair to estimate the quantities of nutrients furnished by this diet, as few of the quantities are definitely stated. However, such calculations have been made on the basis of what is believed to be an average menu of the character suggested and the

average amounts of the different foods which would be served ordinarily.

The quantities assumed per man per day were 2 eggs, 4 ounces; toast, 3 ounces; fowl, 3 ounces; vegetable soup, 6 ounces; tenderloin steak, 3 ounces; rice pudding, 6 ounces; oranges, 5 ounces; consommé, 6 ounces; vegetables (as potatoes), 5 ounces; bread, 9 ounces; butter, 3.5 ounces; sugar, 1.5 ounces; and milk, 4 ounces. On the basis of average values for composition this daily ration would supply 103 grams protein and 1,820 calories of energy. This is practically the amount of protein, but considerably less energy than is called for by the standard proposed by Voit for old men.

Diet in old age is discussed by H. Campbell in a recently published volume,<sup>a</sup> edited by G. A. Sutherland, dealing with diet and dietetics in health and disease. The most suitable diet for the aged, it is pointed out, is that—

which constitutes the ideal diet for man in general. Such a dietary demands (a) moderation in quantity, (b) simplicity in quality, and (c) the avoidance of those starchy foods which are apt to slip into the stomach without having been first adequately insalivated \* \* \*.

By a simple diet is meant one consisting of such items as bread, plain biscuits, plain puddings, plainly cooked vegetables, fruit, meat, bird, fish (all plainly cooked), milk, butter, cheese (such as Cheddar), tea, coffee, cocoa, salt.

Doctor Campbell has devoted a great deal of attention to the study of the evolution of the diet of man, and in his discussion of diet for the aged considers the subject to some extent from this standpoint.

It is worthy of note that the diet of early man conformed to these three requirements. It was simple, consisting as it did of unprepared animal and vegetable substances; the quantity was not on the whole in excess of physiological needs; and all the starchy food being raw, it had to be abundantly masticated in order to break up the nondigestible cellulose framework and thus liberate the contained foodstuffs.

The three important food functions from a dietetic standpoint, as the author points out, are "digestion (i. e., the conversion of the ingested food into nutrient plasma), metabolism (i. e., the nutritive changes which the absorbed food undergoes in the tissues), and excretion (i. e., the removal of waste products).

These three functions, as we may term them, are most vigorous in youth and early adult life. Then it is that digestion is most vigorous, metabolism most active, and excretion most efficient. At 40, or thereabouts, the digestive function often begins to show signs of failure, and greater care has to be exercised in the selection of food than was before necessary. Apart from this there is now a greater disposition to prudence—the recklessness of youth tends to depart with maturer years \* \* \*. This dietetic imprudence may survive childhood, adolescence, early adult life, nay, it may persist into old age, but most people have acquired some sort of dietetic wisdom by the time they have reached middle age.

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<sup>a</sup> A System of Diet and Dietetics. London, 1908, pp. 731-740.

At this period not only does digestion often begin to lose its former vigor, but metabolism also shows signs of flagging \* \* \*.

Except in the case of definite disease of the excretory organs, it is doubtful whether the aged suffer in any marked degree from their inefficiency.

Regarding the dietetic instincts of the aged, some general statements are made, from which the following are quoted :

Though doubtless the appetite for plain food tends to lose its keen edge with advancing years, and the dietetic instinct—the liking for different kinds of food—to alter somewhat, the changes in these respects are often less marked than might perhaps have been expected.

The appetite for plain food may last to extreme old age. We have found from inquiry at several workhouses that the aged inmates have, for the most part, right good appetites for the simple fare provided, and that their dietetic instincts are much the same as those of their younger companions \* \* \*.

Perhaps the most notable change which the dietetic instinct undergoes with advancing years is expressed by the gradual curtailment of starchy and sugary food during early and middle adult life. Most children are very fond of sugar and cakes, but this liking often suffers a marked diminution when adult life is reached. This is more noticeable in the man than in the woman \* \* \*. After middle life the saccharids are often still further cut down : The "sweet" becomes the least welcome part of the meal and is frequently passed by.

With respect to the capacity of the organism to cope with different kinds of food, the influence of custom and idiosyncrasy, as well as old age, must be reckoned with, as Doctor Campbell points out.

As to the first of these influences, while one should be cautious in recommending to an aged person a diet very different from that to which he has for many years been accustomed, the experience derived from prisons, work-houses, and similar institutions shows that the ability of the aged to adapt themselves to novel kinds of diet is by no means small. \* \* \*

The factor of idiosyncrasy is an important one. Individuals differ greatly, quite irrespective of age, in their digestive and metabolic capacities. We meet with children who are unable to tolerate foods which old people can digest quite easily, and, again, with others who are made ill by even a slight excess, while their grandparents can perhaps consume a large excess with comparative impunity. Some old people have, in fact, prodigious powers of digestion and metabolism. \* \* \* Most of these remarkable old people would doubtless enjoy better health \* \* \* on a more abstemious diet; nevertheless, in regulating their food we must make due allowance for their prodigious powers \* \* \*.

Making due allowance, however, for the personal element, our rule obtains that while all should endeavor to conform as far as possible to the ideal dietary, allowing themselves no more than an occasional excess, it becomes with advancing years increasingly necessary for the majority of people to eat moderately of simple foods, and not to swallow starchy foods without having first insalivated them thoroughly. If we add to these rules the further ones that old people should take full advantage of dental surgery, that in the case of the toothless certain of the tougher varieties of food should be broken up mechanically before being taken, and finally that due regard should be had to the influence of idiosyncrasy and habit, we have said all that is worth saying concerning the diet of the aged.

The dietary for men from 60 years of age at one of the large London workhouses, according to Doctor Campbell,<sup>a</sup> consists of 20 ounces bread, 1 ounce oleomargarine, 1 ounce sugar, 4 ounces meat, 8 ounces potatoes, and 4 ounces green vegetables per day, with pudding once a week and stewed fruit twice a week. Salt and pepper are allowed daily and mustard once a week. Each person is allowed 2 pints of tea a day. The bread, it is stated, is baked from grain ground on the premises. Most of it is made from so-called "whole meal," but a small portion consists of 2 parts of white flour and 1 part of whole meal.

For purposes of comparison with the other data included in this bulletin, the nutritive value of this dietary has been calculated by means of average figures, and, as shown by data in the table on page 84, supplies 79 grams protein and 2,340 calories per man per day.

Concerning this diet Doctor Campbell makes the following statements:

It must be admitted that this is an ample allowance, probably in excess of actual requirements. Nevertheless, most of the inmates, even the very old ones, consume the whole of their portion and appear to enjoy it thoroughly. The toothless among them seem to manage quite well; the bread crusts they soak in their tea, and the meat is generally, though by no means in every case, minced for them.

It is noteworthy that these old people complain very little of indigestion, and—what is even more surprising—suffer little from constipation. Thus in one large workhouse each inmate gets on an average no more than three doses of aperient in the year. Doubtless this comparative absence of indigestion and constipation is to be explained by the simplicity and good quality of the food provided, by the clock-like regularity of the daily routine, and by the high hygienic standard prevailing in the workhouse.

Of special studies with aged persons the following seem particularly interesting:

In connection with an extended series of studies on respiration and metabolism, carried on by Sonden and Tigerstedt <sup>b</sup> with a respiration apparatus of special construction, young, middle-aged, and old subjects were included. The data recorded show that with both men and women the amount of carbon dioxid excreted per square meter of surface area is greater with young than with older persons, which it is believed is a proof that, independent of its smaller size, the young organism possesses a more active metabolism than the older one. In youth the carbon dioxid excreted per kilogram of body weight and per square meter of surface area is greater with males than with females. This difference gradually diminishes, and in old age there is no difference in the sexes in this respect.

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<sup>a</sup> A System of Diet and Dietetics. London, 1908, pp. 731-740.

<sup>b</sup> Skand. Arch. Physiol., 6 (1895), p. 1.

Kovesi<sup>a</sup> found, in studies with women aged, respectively, 76 and 78 years, that it was possible to attain nitrogen equilibrium with 10.6 to 12.3 grams of nitrogen per day, and that in extreme old age the energy requirements of the body were lowered, 20 calories per day per kilogram body weight being, in his opinion, the lowest limit. The conclusion was also reached that cell metabolism is less active in old age than in youth and that this accounts for the diminished protein requirement which was observed and which is considered characteristic of old age.

From his experiments with old women, von Limbeck<sup>b</sup> concluded that the digestibility of protein and fat was normal and that, in general, the proportion of the different nitrogenous constituents of the urine was practically normal with the exception of ammonia. Notwithstanding the low energy value of the diet, both his subjects gained in weight and excreted less nitrogen than was consumed. In other words, the nutrients and energy supplied by the food seemed amply sufficient for the body needs.

A woman whose dietary was studied by Fenger<sup>c</sup> was 61 years old at the beginning of the experimental period and was under observation at intervals for fifteen years. From choice her diet was very simple, consisting of such foods as eggs, oatmeal, soup, skim milk, fruit, and a little wine. On this simple diet the subject remained in good health and seemed normal as regards the assimilation of nitrogen. No tests were made of the effects of diets of different character. Fenger considers it fair to conclude that a diet may be considered suitable for the old which contains protein enough to supply body demands and maintain health through long periods, requirements which were evidently met by the diet selected by the subject of his experiments.

Interesting and valuable as these and other similar investigations undoubtedly are, it is evident that they do not furnish so broad a basis for dietary standards as do the much more numerous studies of persons in full vigor. The standards most commonly accepted for the aged are those of Voit, who bases them mainly on the work of Forster. They indicate a ration with about 0.8 of the nutritive value of those indicated for men or women in full vigor and at moderate muscular work; in other words, from 90 to 100 grams of protein and from about 2,100 to about 2,900 calories of energy per man per day, or from 80 to 100 grams of protein and from 2,100 to 2,900 calories of energy per woman per day, the amounts to be varied according to the muscular work performed.

<sup>a</sup> Centbl. Inn. Med., 22 (1901), p. 121.

<sup>b</sup> Ztschr. Klin. Med., 26 (1894), p. 437.

<sup>c</sup> Skand. Arch. Physiol., 16 (1904), p. 222.

One of the most thorough attempts to determine exactly the amount of nutrients necessary for the maintenance of the body at different ages is that of Maurel.<sup>a</sup> He estimates from his own clinical and experimental observations and those of others that to maintain the body in equilibrium when no external muscular work is performed the adult in full vigor, either man or woman, requires 1.5 grams of protein and from 35 to 38 calories of energy per kilogram of body weight, any muscular exertion being met by an increased supply of nutrients. Thus, for a man weighing 70 kilograms (154 pounds), the daily maintenance ration, according to Maurel, should contain 105 grams of protein and from 2,450 to 2,660 calories of energy, or for a woman weighing 60 kilograms (132 pounds), 90 grams of protein and from 2,100 to 2,280 calories of energy. For persons in the first period of physical decline (from 50 to 70 years), he considers that the protein may be reduced to 1.25 grams and the energy to from 30 to 35 calories per kilogram of body weight. In the second period of old age (from 70 years on), he believes that the nutritive demands fall off yet more until, in extreme age, 0.75 grams of protein and from 20 to 25 calories of energy per kilogram of body weight are ample to maintain the body in equilibrium. Of course, as age increases, general muscular exertion usually decreases also, so that the maintenance ration just quoted approaches the total requirement much more nearly than do those given for persons in full vigor, even where the latter perform little external muscular work. It should also be noted that body weight usually decreases rapidly in old age, even among people whose food is abundant, and hence, if we estimate nutritive requirements per kilogram of body weight, they decrease correspondingly.

If we take the average weight of persons in old age as given by Quetelet<sup>b</sup> and apply to them the maximum factors suggested by Maurel we find the maintenance ration to be as given in the following table:

*Estimated food requirements of aged men and women based on Maurel and Quetelet figures.*

Subjects.	Age.	Average weight.		Protein required.	Energy required.
		Years.	Kilograms.	Pounds.	Grams.
Men.	60	65.50	144.1	81.9	1,965
	70	63.03	138.7	78.8	1,891
	80	61.22	134.7	45.9	1,531
	90	57.83	117.2	43.4	1,446
Women.	60	56.73	124.8	70.9	1,702
	70	53.72	118.2	67.2	1,612
	80	51.52	113.3	38.6	1,288
	90	49.34	108.5	37.0	1,234

<sup>a</sup> Rev. Soc. Sci. Hyg. Aliment., 3 (1906), p. 763.

<sup>b</sup> Landois and Sterling: Text-book of Human Physiology, London, 1891.

While Maurel's factors give for adults in full vigor a ration hardly below that commonly accepted, his standards for the aged are lower than those usually applied. Since, however, he takes into account the decrease of body weight as well as of activity, it may be that they represent more nearly the minimum ration which may safely be applied. However, they represent a maintenance ration merely, and any external muscular work must be met by an increased ration.

#### FOOD IN BALTIMORE AND PHILADELPHIA HOMES FOR THE AGED COMPARED WITH OTHER INSTITUTIONS AND STANDARDS.

A summary of the results of the dietary studies in Baltimore and Philadelphia is given in the following table, which also includes for purposes of comparison the results of a number of dietary studies made elsewhere in public institutions, as well as data from the investigations and the standards referred to in the preceding section.

*Summary of studies in public institutions and studies with, and standards for, aged persons.*

Study No.	Location and subjects of studies.	Number of persons in study.	Nutrients and energy.					
			In food eaten.		In food wasted.		Proportion in food wasted.	
			Protein.	Energy.	Protein.	Energy.	Protein.	Energy.
<b>STUDIES IN INSTITUTIONS.</b>								
682	Bayview, Baltimore: Regular inmates, males ..	136	Grams.	Calories.	Grams.	Calories.	Per cent.	Per cent.
683	Chronic inmates, males ..	82	144	2,901	4	97	3	3
685	Receiving-ward inmates, males ..	82	93	2,076	2	45	2	2
684	Average of 3 studies ..	.....	111	2,274	1	11	1	2
684	Women inmates, per woman per day ..	121	121	2,504	3	59	2	2
684	Women inmates, per man per day basis ..	111	85	1,924	6	134	7	7
684	Average of 4 studies ..	411	106	2,405	8	168	7	7
686	Entire institution <sup>a</sup> ..	411	117	2,453	4	89	3	3
686	Aged women's home, Baltimore, per woman per day ..	96	96	2,398	.....	.....	.....	14
687	Aged men's home, Baltimore, per man per day ..	85	85	2,206	12	308	14	14
688	German Aged People's Home, Baltimore, per man per day ..	83	83	2,339	9	304	11	13
691	Old Ladies' Home, Philadelphia, per woman per day ..	74	74	2,225	8	265	11	12
	Government Hospital for the Insane, male patients: <sup>b</sup>	.....	.....	.....	.....	.....	8	8
	Middle to old age, largely chronic, orderly, quiet, few workers, average of 10 studies ..	952	88	2,767	13	341	13	11
	Acute, nervous, disturbed, nonworkers, average of 3 studies ..	94	84	2,599	22	567	21	18
	Negroes, whole group ..	169	98	2,536	12	315	11	11
	Negroes, nonworkers ..	89	90	2,402	12	306	12	11
	Negroes, workers ..	80	108	2,694	13	319	11	11
	Sick, infirm, and bedridden, average of 2 studies ..	166	97	2,519	34	802	26	24
	Younger and more active class, some curable, part workers, average of 2 studies ..	59	104	2,917	12	256	10	8

<sup>a</sup> Calculated from food purchased (see p. 36).

<sup>b</sup> U. S. Dept. Agr., Office Expt. Stas. Bul. 150.

*Summary of studies in public institutions and studies with, and standards for, aged persons—Continued.*

Study No.	Location and subjects of studies.	Number of persons in study.	Nutrients and energy.					
			In food eaten.		In food wasted.		Proportion in food wasted.	
			Protein.	Energy.	Protein.	Energy.	Protein.	Energy.
<b>STUDIES IN INSTITUTIONS—con.</b>								
Government Hospital for the Insane, male patients—Con.								
Better class, on first section diet, average of 2 studies.....		22	Grams.	Calories.	Grams.	Calories.	Per cent.	Per cent.
Unclassified, average of 2 studies.....		127	125	3,398	29	753	19	18
Unclassified, average of all patients.....								
New York state hospitals for the insane, male patients:								
Chronic, infirm, average of 8 studies.....		1,069	72	2,259	4	90	5	4
Light workers and disturbed, average of 2 studies.....		318	73	2,255	4	94	5	4
Restless, active, disturbed, average of 2 studies.....		258	95	2,665	6	142	6	5
Workers, average of 10 studies.....		1,595	105	2,908	7	132	7	4
Acute, recent admission, average of 2 studies .....		70	65	2,477	7	161	9	6
Acute and sick, chronic, average of 2 studies.....		35	66	2,432	4	94	6	4
Almshouse, Baltimore, 1852: <sup>a</sup>								
Nonworkers.....			78	1,959				
Workers.....			85	2,057				
Long Island almshouse and hospital, Boston <sup>b</sup> .....		109		3,164				
Charlestown almshouse and hospital, Boston <sup>b</sup> .....		71		2,415				
Scotch poorhouse: <sup>c</sup>								
Adults, both sexes, just admitted, no work.....			84	1,870				
Adults, both sexes, regular inmates, no work.....			86	2,030				
Adults both sexes, regular inmates, work.....			112	2,380				
Scotch Almshouse for Pauper Lunatics: <sup>d</sup>								
Excessive dietaries, males, average of 11 studies.....			149	3,789				
Dietaries approximating standards, females, average of 13 studies.....			136	3,340				
Deficient dietaries, males, average of 15 studies.....			119	2,998				
Excessive dietaries, females, average of 25 studies.....			119	3,057				
Dietaries approximating standards, females, average of 8 studies.....			108	2,695				
Deficient dietaries, females, average of 6 studies.....			95	2,488				
Home for Old Men, Munich <sup>e</sup> .....		92		2,155				
Home for Old Women, Munich <sup>e</sup> .....		80		1,875				
Old men (over 60 years) workhouse, London <sup>f</sup> .....		79		2,340				

<sup>a</sup> Calculated from data given by Gould; Report on Food and Diet Suited for Almshouses, Prisons, and Hospitals. New York, 1852, p. 79.

<sup>b</sup> Ellen H. Richards and Sarah E. Wentworth; Second Report of Institutions Commissioner. Boston, 1897, p. 206.

<sup>c</sup> R. E. Aitchison. Some Effects of Certain Diets Upon Excretion by the Kidneys and by the Blood. Edinburgh, 1896. Cited by Dunlop; Report Prison Dietaries. Glasgow, 1899, p. 127.

<sup>d</sup> J. C. Dunlop. Supplement to Report Board of Commissioners in Lunacy. Scotland, 43 (1902), p. 92.

<sup>e</sup> Forster. Cited from U. S. Dept. Agr., Office Expt. Sta. Bul. 21.

<sup>f</sup> G. A. Sutherland. A System of Diet and Dietetics. London, 1908, p. 731.

*Summary of studies in public institutions and studies with, and standards for, aged persons—Continued.*

Study No.	Location and subjects of studies.	Number of persons in study.	Nutrients and energy.					
			In food eaten.		In food wasted.		Proportion in food wasted.	
			Protein.	Energy.	Protein.	Energy.	Protein.	Energy.
<b>STUDIES WITH INDIVIDUALS.</b>								
Woman, 79 years old, weight 38 kilograms, 1st study <sup>a</sup> .		71	Grams.	Calories.	Grams.	Calories.	Per cent.	Per cent.
Woman, 79 years old, weight 38 kilograms, 2d study <sup>a</sup> .		71		1,289				
Woman, 81 years old, weight 37 kilograms <sup>a</sup> .		71		1,291				
Woman, 76 years old, weight 45 kilograms, 1st study <sup>b</sup> .		77		1,226				
Woman, 76 years old, weight 45 kilograms, 2d study <sup>b</sup> .		66		1,361				
Woman, 76 years old, weight 45 kilograms, 3d study <sup>b</sup> .		66		1,361				
Woman, 78 years old, weight 61 kilograms, 1st study <sup>b</sup> .		41		1,165				
Woman, 78 years old, weight 61 kilograms, 2d study <sup>b</sup> .		41		1,275				
Woman, 78 years old, weight 61 kilograms, 3d study <sup>b</sup> .		67		1,575				
Woman, 61 years old, 1st diet <sup>c</sup> .		80		1,207				
Woman, 61 years old, 2d diet <sup>c</sup> .		85		1,125				
Woman, 61 years old, 3d diet <sup>c</sup> .		87		1,230				
Woman, 61 years old, 4th diet <sup>c</sup> .		84		1,600				
<b>DIETARY STANDARDS.</b>								
Voit's standards: <sup>d</sup>								
Old man, no work.		90		2,116				
Old man, light work.		100		2,689				
Old woman, no work.		80		1,831				
Old woman, light work.		85		2,096				
Old people, hard work.		100		2,898				
Maurel's maintenance standards: <sup>e</sup>								
Men, 60 years, average weight, 66 kilograms.		82		1,965				
Men, 70 years, average weight, 63 kilograms.		79		1,891				
Men, 80 years, average weight, 61 kilograms.		46		1,531				
Men, 90 years, average weight, 58 kilograms.		43		1,446				
Women, 60 years, average weight, 57 kilograms.		71		1,702				
Women, 70 years, average weight, 54 kilograms.		67		1,612				
Women, 80 years, average weight, 52 kilograms.		39		1,288				
Women, 90 years, average weight, 49 kilograms.		37		1,234				
U. S. Department of Agriculture standards: <sup>f</sup>								
Man, moderate muscular work, period of full vigor—								
Food purchased.		115		3,800				
Food eaten.		100		3,500				
Old man or woman—								
Food purchased.		104		3,400				
Food eaten.		90		3,150				
Extreme old age, man or woman—								
Food purchased.		81-90		2,660-3,040				
Food eaten.		70-80		2,450-2,800				

<sup>a</sup> von Limbeck. Ztschr. Klin. Med., 26 (1894), p. 437.

<sup>b</sup> Kovesi. Centbl. Inn. Med., 22 (1901), No. 5, p. 121.

<sup>c</sup> Fenger. Skand. Arch. Physiol., 16 (1904), p. 222.

<sup>d</sup> Ztschr. Biol., 12 (1876), p. 32.

<sup>e</sup> See page 82.

<sup>f</sup> U. S. Dept. Agr., Yearbook 1907, p. 361.

In the studies made in the three Baltimore homes for the aged, none of the diets provided more than the 85 grams of protein called for by the suggested standard for persons in the decline of life, and in one case the diet provided only 74 grams. Considering that the subjects all seemed satisfied with the amount of their food and that their general health was as good as could be expected at their age, the natural inference is that the suggested protein standard is ample for the nutritive needs of persons in extreme age and with comparatively little activity—that, indeed, it may be possible to support life comfortably and well on a somewhat smaller amount, as Maurel's work has suggested. It does not necessarily follow, however, that the usual standard ought, therefore, to be reduced, for the latter is not intended to represent the minimum or even the average physiological requirement, but rather to suggest an amount ordinarily demanded by properly nourished subjects, and to serve as a basis in planning dietaries, especially in public institutions. Since in most public institutions economy is rigidly insisted on, there would be more danger to the comfort of the inmates from setting the standard too low than too high. From this point of view these studies seem to corroborate the propriety of the present protein standard. As regards the energy, two of the studies showed a consumption within 25 calories of the 2,200 calories suggested by the standard, while in the other it amounted to 2,339 calories per man per day. Certainly this does not indicate too high an energy value in the suggested standard.

Another interesting point suggested by these studies is the comparative requirements of men and women in extreme age. It will be recalled that the first study in the Baltimore private institutions was made in a home for aged women, the second in a similar institution for aged men, and the third in a home for the aged of both sexes. The protein consumption was highest in the first and lowest in the last. The energy consumed per man per day in the men's home was about 100 calories more than in either the women's home or that for both sexes; but it should be borne in mind that these men averaged a little younger and were perhaps also a little more active than the subjects in the other studies. These facts hardly sustain the ordinary assumption that the food requirements of women are only 0.8 of those of men of similar age and activity, but imply rather that, as has been pointed out by earlier observers (see p. 80), in extreme age the food needs of the two sexes become more or less identical.

Compared with the results of dietary studies of individuals reported by von Limbeck, Kövesi, and Fenger, and the estimated nutritive value of the diet proposed by Sir Henry Thompson, the groups studied in Baltimore and Philadelphia obtained in their diet an abundance of both protein and energy.

The studies here reported have already been discussed to some extent in comparison with other institutions (see pp. 43, 44).

The smallest amounts of protein and energy noted in the present studies among the aged were found in the home for aged women in Philadelphia. When we consider, however, that the average age of the inmates was about 78 years, and that their muscular activity was probably very slight, it seems not improbable that the 58 grams of protein and 1,882 calories of energy supplied by the diet were amply sufficient for their needs. According to Maurel, 39 grams of protein and 1,288 calories of energy is a maintenance ration for women of 80; the 19 grams of protein and 594 calories of energy in excess of this should be sufficient for the small amount of muscular exercise taken. Considering that in this study the food served was not limited in amount and at the same time appeared appetizing, so that the inmates were not prevented by lack of food or by distaste from eating all they needed, it may be taken to indicate that amounts lower than those suggested by Voit may be ample for persons in extreme age.

No special standards for the aged have been proposed hitherto as a result of data obtained in the Department of Agriculture nutrition work, as little material gained by experimental studies was available on which to base them. Voit's factors have usually been accepted as indicating an abundant ration for institution dietaries for the aged.

On the basis of the work reported in this bulletin and other available data, it seems fair to propose 0.9 as the factor representing the proportion of protein and energy required in old age by a man or woman as compared with a man at moderate muscular work during the period of full vigor, and 0.7 to 0.8 as the factor representing the relative food requirement for extreme old age. The actual quantities of protein and energy will vary according to the basis of comparison selected, whether it be food purchased, food eaten, or food digested.<sup>a</sup> The standard proposed is generous rather than the reverse and is in accord with American food habits, and seems a reasonable guide for use in institutions or homes in planning diet for the aged.

#### **DIETARY STUDIES WITH CHILDREN AND THEIR RESULTS.**

A large number of carefully conducted investigations on infant feeding have been reported, and the literature on the subject is extensive, but relatively few studies have been made in connection with the nutrition problems of older children.

Of recent work with infants, the investigations of Michel and Perret<sup>b</sup> on the rational feeding of infants from birth to 2 years

<sup>a</sup> U. S. Dept. Agr., Yearbook 1907, p. 61.

<sup>b</sup> Rev. Hyg. et Méd. Infant., 5 (1906), No. 6, p. 477.

may be mentioned as representing methods followed in the accumulation of data and the application of the results of highly technical experiments to the practical problems under consideration. When possible, everyone concedes that it is best that the infant should be breast fed, but when this is impossible substitutes for natural feeding must be found, and these authors have endeavored to establish a scientific ration for the artificial feeding of infants. They have taken as a basis for their calculation a large amount of experimental and empirical data which they summarize with respect to the average weight of new-born infants, the gain in weight during different periods, the nature of the gain in terms of the composition of the body, the amount and character of material ingested and egested by infants breast fed and nourished on cow's milk diluted with water and sweetened with milk sugar, the amount of energy eliminated by infants per kilogram of body weight and per square meter of surface area, and similar data.

According to the calculations which they give, an infant weighing 8 kilograms has a surface area of 3.696 square meters, and on the basis of 150 calories per square meter would require 554 calories of available energy for maintenance. The calculated amount of nitrogen necessary for a gain of 1 gram in body weight is 0.02179 gram. Taking account of these values, they propose a ration which can be modified to provide for the proper maintenance and growth, in accordance with the different weights of the infant at different periods, and report observations on the effects of feeding a number of infants in accordance with the method proposed.

Mention should also be made in this connection of important papers recently published by Rubner on nutrition processes during the growth of the child,<sup>a</sup> the theory of nutrition after completion of growth,<sup>b</sup> and problems of growth and length of life from the standpoint of energetics.<sup>c</sup>

In his theoretical discussion of diet during the period of growth Rubner emphasizes the importance of energy constituents, and gives reasons for his belief that the protein requirement of children has been sometimes overestimated.

In the second of the papers referred to theories of nutrition are discussed chiefly with reference to protein metabolism. This factor, the author states, varies according to the protein requirements of the cell, the cell with little protein retaining more of the protein supplied to it than one which is rich in this constituent. For this reason a large

<sup>a</sup> Arch. Hyg., 66 (1908), No. 1-2, p. 81.

<sup>b</sup> Arch. Hyg., 66 (1908), No. 1-2, p. 1.

<sup>c</sup> Arch. Hyg., 66 (1908), No. 1-2, p. 127; Sitzber. K. Preuss. Akad. Wiss., 1908, II, p. 32; Das Problem der Lebensdauer und seine Beziehungen zu Wachstum und Ernährung. Münich, 1908.

protein supply does not cause so great nitrogen excretion in the former case as in the latter.

The author discusses nitrogen metabolism and gain on a basis of the amount of nitrogen present in the body rather than on the usual basis of body weight. Cell function is the primary consideration in protein metabolism. The cleavage of protein accommodates itself to this factor, and there is a relationship between cell function and the size of the body. Within certain limits nitrogen metabolism is more rapid the more protein is supplied.

The problems pertaining to growth and length of life, Rubner discusses with reference to man and other mammals, particularly from the standpoint of energetics. With respect both to the amount of protein and energy required during the nursing period to double the body weight, man, he states, forms an exception to the other mammals included in the discussion, in that on a uniform basis of comparison he requires smaller quantities of protein and about six times as much energy, the domestic mammals requiring on an average, according to the author's calculations, 4,808 calories for building a kilogram of body material.

A comparison is also made between man and other mammals with respect to the proportion of energy supplied during the nursing period which is retained in the body. In this respect man also differs from the ordinary domestic animals, since he retains only 5.2 per cent of the net energy supplied, in comparison with 34.3 in the case of domestic animals. This value is called by the author "quotient of growth." He estimates further that in domestic animals the ratio of food supply to maintenance is 202 to 100, and in man 120 to 100, so that in the case of domestic animals 69 per cent of the material supplied is retained, in comparison with 6.2 per cent in the case of man.

According to Rubner's summary, the time required by the young animal for doubling the body weight is inversely proportional to the intensity of metabolism, and therefore the shorter the period of growth the greater the metabolism of energy. The intensity of energy metabolism is a function of surface area, and therefore small animals show the more rapid growth.

In his discussion of the duration of life Rubner estimates that in the domestic animals each kilogram of body weight after growth is completed requires practically the same quantity of energy. Man forms an exception to this rule, in that he requires about four times as much as the other mammals. It follows, therefore, that man requires a greater proportional energy supply than other mammals.

The nutrition publications of this Office and other similar publications commonly give factors showing the dietary requirements of children in comparison with adult man at moderate work. These deduc-

tions very largely depend upon experimental evidence reported by Voit and others, which has been summarized in previous publications of this Office,<sup>a</sup> including the classic work of Camerer with his own children at different ages, and studies with other children by Forster, Uffelmann, Hasse, Schroeder, and Prausnitz, together with later work by Magnus-Levy, Pautz, and others.

Camerer's<sup>b</sup> work is especially noteworthy, both for its extent and the thoroughness with which it was conducted. Details of foods consumed, gains in weight and height, and similar data are recorded, as well as the results of extensive digestion experiments and studies of the income and outgo of nitrogen. The results obtained in Camerer's earlier work have been summarized in the Department of Agriculture publications referred to above, and are included in averages given in the table on page 94.

In a publication which appeared more recently he considers the whole question from the standpoint of metabolism from birth to the end of the period of growth.<sup>c</sup> His later work with children has to do more particularly with infants and their digestion, metabolism, and growth.<sup>d</sup>

Maurel's extensive work and deductions regarding the food of children are referred to elsewhere (see p. 95) in a discussion of the dietary studies reported in this bulletin.

A few studies with infants and children have been reported in connection with the nutrition investigations of this Office, though the amount of this work is limited, owing to general conditions under which the enterprise has been conducted. Atwater and Woods<sup>e</sup> report dietary work with an infant, while Jaffa, of the California Experiment Station, reports similar work and studies of children living on a fruitarian diet.<sup>f</sup>

As regards general discussions of the feeding of children, particularly during periods of infancy, the literature is perhaps more extensive than is the case with almost any other question of dietetics.

<sup>a</sup> U. S. Dept. Agr., Office Expt. Stas. Buls. 21 and 45.

<sup>b</sup> Ztschr. Biol. (1880), p. 24; (1882), p. 220; (1884), p. 556; (1888), p. 141; (1893), pp. 227, 398.

<sup>c</sup> Der Stoffwechsel des Kindes von der Geburt bis zur Beendigung des Wachstums. Tübingen, 1896.

<sup>d</sup> Die Verdauungsarbeit, ihre Grösse und ihr Einfluss auf den Stoffwechsel, insbes. den Stoffwechsel des Säuglings. 1900. Reprinted from Jahrb. Kinderheilk., n. ser., 51 (1900), p. 26.

Zur Physiologie des Säuglingsalters. Berlin, 1902. Reprinted from Jahrb. Kinderheilk., n. ser., 56 (1902), p. 543.

Die körperliche Entwicklung, die Ernährung und Pflege des Kindes. Stuttgart, 1902.

<sup>e</sup> Connecticut Storrs Sta. Rpt. 1895, p. 129.

<sup>f</sup> U. S. Dept. Agr., Office Expt. Stas. Buls. 107, 132.

Of recent discussions of the diet of children may be mentioned the monograph by Miss Caroline L. Hunt on the food of school children.<sup>a</sup> which sums up the bulk of the published literature on this subject.

As to the character of the different meals, Miss Hunt states that, while a general idea of the amount of food required should be kept in mind, no special effort need be made to balance each meal.

In general, the simplest foods should be given at night. Bread, milk, and simple sweets, like stewed fruits or plain cake, make a good supper for little children. The most important parts of the breakfast are milk, cereal or toast, and fruit. The question arises with school children whether the heavy meal ought to be at noon or night. At noon the meal may interfere with the afternoon work, at night with sleep. It should be remembered that the heavy meal usually means the one which includes meat. The nourishment obtained by the grown person from meat is secured by the child from milk. This may be so distributed through the different meals that there need be no especially large meal. The lunch taken by older people, with the addition of milk, can be considered the dinner of the child. His supper can then precede the regular dinner of the family, and be very simple though nutritious. For school children a warm liquid is desirable at noon. This may be soup or cocoa. Chocolate is too rich. The fact that fats remain longer in the stomach than other substances makes it particularly undesirable to serve fatty foods at noon if the child is to return soon to work.

Many of the medical text-books and works of reference on diet under conditions of health and disease take up the question of the feeding of children of different ages. In an article of this character which forms a part of recent work on dietetics and which embodies the results of clinical experience as well as other information, G. A. Sutherland<sup>b</sup> summarizes and discusses a large amount of information on the feeding of infants before and after weaning and of children from the second to the seventh year and during school life.

As regards diet from the second to the seventh year, the period characterized by active exercise, it calls for "an increased amount of carbohydrates and of proteins; in other words, of energy-producing and muscle-forming materials," as compared with the previous diet, and, according to the author, should be made up of simple foods, such as milk, eggs, butter, cream, minced or finely cut meat, fish, vegetable soups, light meat soups, cereals, simple puddings, vegetables, and fruits.

Bread forms a most important element in the diet. The amount of bread and butter or jam that an active 4-year-old child will consume at a meal is astonishing. Care must be taken, however, that the butter or jam is not the element which makes the bread go down. White or brown bread may be used, and it should be at least twenty-four hours old. It may be plain or toasted. All plain biscuits are also to be allowed, sweetened ones being regarded as an occasional luxury \* \* \*.

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<sup>a</sup> Bur. of Ed. [U. S.] Bul. 3, 1909, p. 7.

<sup>b</sup> A System of Diet and Dietetics. London, 1908, pp. 743-799.

The natural demand of the organism for sugar must be fully satisfied, and it is better to do so by the use of sugar in the food than by the artificial products of the manufacturer, which are often taken in excess apart from meals. Puddings and stewed fruit can be suitably sweetened. Honey, sirup, and jam can be taken with bread, biscuits, and puddings. At the same time it is not advisable to ruin the taste for plain foods by oversweetening a number of the dishes.

Fruits contain a considerable amount of sugar in a very assimilable form \* \* \*. In hot weather it will be found useful to reduce the amount of the more substantial elements of the diet and to increase the amount of the fruit and vegetables. Special care must be taken to insure that the fruit is in proper condition, i. e., neither unripe nor too ripe, as unwholesome fruit disturbs the alimentary tract most seriously \* \* \*.

The training in mastication should be perseveringly continued by the use of some hard articles of food. Until this is learned it may be necessary to give meat in a pounded, minced, or shredded form. The habit of bolting the food, acquired from the fluid diet of infancy, must be checked, and a slow methodical habit of eating should be acquired early in life.

In considering diet during school life, Sutherland considers the problem both with reference to home conditions and the boarding-school system which, particularly for boys, is such a characteristic feature of English school life. At about the eighth year, when the author assumes that school life begins, the child has reached an age when—

In addition to the requirements of the body for growth, repair, and exercise, we have to consider the work of the brain in connection with the diet. It is recognized by all that a growing boy or girl requires a large amount of nourishing food, and that at the same time the amount varies very largely with the individual. Consequently it is not advisable to stuff the child who does not appear to come up to an imaginary standard, or to starve the child who seems to go beyond it. If the child is having a duly apportioned amount of work and play, of sleep and out-of-door exercise, his appetite will be the best guide as to the amount of food required. The appetite must be a healthy one, i. e., trained on a diet of wholesome, plain foods, for a pampered appetite, previously developed on dainty highly seasoned dishes, can not be regarded as of any value whatever as a test.

If the appetite is debased in any way Doctor Sutherland emphasizes the importance of special study and special treatment.

As with adults, a very important factor in determining the amount of food is the physical work performed. The amount of exercise which a child takes in the open air will have a direct influence on the appetite and also on the quantity of food he should take. Exercise before food should not be pushed to the extent of producing exhaustion, or both the appetite and the digestion will be impaired. The natural man tends to rest after a meal, but the healthy child will be eager for exercise. Consequently it is not necessary to forbid such exercise, provided that it is of the nature of play, and not of a tiring character.

The quality of the diet should be such that a due proportion of proteins, carbohydrates, and fats enter into it. The chief difference from the feeding in earlier years is that a larger amount of beef and mutton is called for. Although the proteins required can be supplied in other foods, meat has the advantages of being the most concentrated, the most digestible, and the most palatable form in which they can be given. Meat should be given twice a day \* \* \*. Additional proteins are to be supplied in the form of milk, eggs, oatmeal, etc.

The quality of the food is a matter of great importance, to which the author devotes particular attention.

If from any reason \* \* \* a distaste for meat or vegetables is produced, the result will be that the feeling of hunger will lead the boy to satisfy it by eating undesirable things, such as sweets, pastry, etc., in excess. These latter appeal to the boyish appetite at all times, and are not in themselves injurious when given in moderation at meals. It is when wholesome and appetizing food is not supplied at table that the habit of eating unwholesome things between meals is developed.

The quality of the food depends greatly on the cooking. As plain cooking is all that a healthy boy's appetite demands, it is not asking too much to say that the food ought always to be well cooked \* \* \*.

Tea and coffee may be added to the dietaries hitherto given, but should not be taken in excess or too strong. Milk at this age will be taken much more readily if flavored with tea or coffee \* \* \*.

The chief meals of the day should be three in number—breakfast, dinner, and supper. Of these the first two should be the substantial meals, while supper should consist of less stimulating material \* \* \*. There should be no hurrying over meals, no bolting of the food \* \* \*. With three good meals in the day no boy should suffer from hunger or from failure of nutrition from lack of food. While greediness as regards food must be checked in certain cases, as it breeds physical ills if tolerated, one must not allow a healthy appetite to remain unsatisfied on the ground that moderation is a desirable virtue.

It would be possible to greatly extend the citations of deductions and opinions of investigators and writers on the subject of the feeding of children, but perhaps enough has been quoted to indicate the extent of the work, the character of the evidence on which conclusions are based, and the deductions of some of those who have approached the subject from the standpoint of the physician, the investigator, and the educator.

The results of the investigations in Baltimore and Philadelphia are summarized in the table which follows, together with the results of some data from other sources.

## Dietary studies with and standards for children.

Description of study or standard.	Number of persons.	Average age.	Average weight.	Protein per day.	Energy per day.
<b>STUDIES IN BALTIMORE AND PHILADELPHIA.</b>					
Home for Colored Children, Baltimore, boys.	25	9	58.6	26.6	50 1,677
German Orphan Asylum, Baltimore, boys.	58	12	59.2	26.9	65 1,798
German Orphan Asylum, Baltimore, girls.	57	12	74.3	33.7	
Orphan Asylum, Philadelphia, boys.	36	9	<sup>a</sup> 62	28.1	68 1,876
Orphan Asylum, Philadelphia, girls.	44	11	<sup>a</sup> 69	31.3	
Average of above studies.		10	67	30.4	61 1,784
<b>FOREIGN STUDIES.</b>					
Children, 2-6 years <sup>b</sup> .	14	4	33	15	53 1,245
Children, 6-10 years <sup>b</sup> .	8	8	53	24	65 1,575
Children, 10-14 years <sup>b</sup> .	13	12	70	31.8	72 1,780
Children, 6-15 years, Orphan Asylum, Munich <sup>c</sup> .					79 1,680
Boys, 8-15 years, Children's Home, Rostock <sup>d</sup> .	38				87 2,905
Girls, 14-19 years, Industrial School, Essen <sup>e</sup> .	71	15 $\frac{1}{2}$			101 2,815
Boy <sup>f</sup> .	1	15			98 1,960
Boy, average of 2 studies <sup>g</sup> .	1	16			106 3,250
<b>SUGGESTED MAINTENANCE REQUIREMENTS.<sup>h</sup></b>					
Child.		2	22	10	18 675
Do.		3	26.5	12	22 792
Do.		5	33.1	15	26 937
Do.		7	39.7	18	32 1,053
Do.		8	44.1	20	35 1,130
Do.		10	55.1	25	42 1,350
Do.		12	66.1	30	53 1,545
Do.		14	88.2	40	70 1,720
Youth.		16	110.2	50	85 2,213
Do.		18	121.3	55	94 2,406
Do.		20	132.3	60	103 2,565
Early maturity.		25	143.3	65	103 2,567
Do.		30	143.3	65	90 2,405
<b>U. S. DEPARTMENT OF AGRICULTURE STANDARDS.<sup>i</sup></b>					
Child, 2-5 years (0.4 food of man).		<sup>j</sup> 35	15.9	42	1,400
Child, 6-9 years (0.5 food of man).		<sup>a</sup> 55	24.9	53	1,750
Boy, 10-11 years (0.6 food of man).		<sup>a</sup> 67	30.4	63	2,100
Boy, 12 years (0.7 food of man).		<sup>a</sup> 78	35.4	74	2,450
Boy, 13-14 years (0.8 food of man).		<sup>a</sup> 85	38.6	84	2,800
Boy, 15-16 years (0.9 food of man).		<sup>j</sup> 117	53.7	95	3,150
Girl, 10-12 years (0.6 food of man).		<sup>a</sup> 69	31.3	63	2,100
Girl, 13-14 years (0.7 food of man).		<sup>a</sup> 89	40.4	74	2,450
Girl, 15-16 years (0.8 food of man).		<sup>j</sup> 111	50.4	84	2,800

<sup>a</sup> Metropolitan Life Insurance Company tables.<sup>b</sup> Forster, Camerer, Uffelman, and Hasse. From Summary in U. S. Dept. Agr., Office Expt. Stas. Bul. 21. See also U. S. Dept. Agr., Office Expt. Stas. Bul. 45.<sup>c</sup> Voit. Untersuchung der Kost, p. 125.<sup>d</sup> Schröder. Arch. Hyg., 4 (1866), p. 39.<sup>e</sup> Prausnitz. Arch. Hyg., 15 (1892), p. 387.<sup>f</sup> Pautz. Ztschr. Biol., 37 (1895), p. 206.<sup>g</sup> Magnus-Levy. Arch. Physiol. [Flüger], 53 (1893), p. 547.<sup>h</sup> Bowditch. Loc. cit.<sup>i</sup> U. S. Dept. Agr., Yearbook 1907, p. 361.<sup>j</sup> Maurel. Loc. cit.

It is commonly assumed that growing children need more nutrients in proportion to their size than adults, first, because extra material is needed for bodily growth; and second, because they have a proportionately larger body surface and require more energy to make good the greater evaporation through the skin. Since girls 6 years old or more usually weigh less than boys of corresponding age, it is also assumed that their nutritive requirements are slightly less. From these assumptions and the practical observations available, the nutri-

tive requirements of children of various ages as compared with those of adults have been calculated. Those given by Atwater and most commonly used in this country are as follows:

Child under 2 years old requires 0.3 the food of a man at moderately active muscular work.

Child 2-5 years old requires 0.4 the food of a man at moderately active muscular work.

Child 6-9 years old requires 0.5 the food of a man at moderately active muscular work.

Boy 10-11 and girl 10-12 years old require 0.6 the food of a man at moderately active muscular work.

Boy 12, and girl 13-14 years old require 0.7 the food of a man at moderately active muscular work.

Boy 13-14, and girl 15-16 years old require 0.8 the food of a man at moderately active muscular work.

Boy 15-16 years old requires 0.9 the food of a man at moderately active muscular work.

Maurel<sup>a</sup>, whose work regarding the nutritive requirements in age, has already been referred to, has made equally elaborate studies of the requirements of children of different ages and weights. He assumes that, exclusive of the extra requirements occasioned by greater body surface, growth, and increasing internal muscular work, the protein required for a bare maintenance ration is the same with children as with adults in full vigor, namely, 1.5 grams per kilogram of body weight. In addition, he allows 0.15 gram for increasing internal muscular work. For growth, 0.10 gram is allowed up to 16 years and from 16 to 20 only 0.05 gram. This makes a total of 1.75 grams of protein per kilogram of body weight up to the age of 16 and from then to 20 years 1.70 grams. There are more variations in the amounts of energy required at different ages because the ratio of body surface to weight is constantly diminishing. For children of 2 years, 67.5 calories per kilogram of body weight is suggested, with gradually decreasing amounts until at 20 years only 42.75 calories are called for. Taking Quetelet's figures for the average weights of normal children of various ages, Maurel has calculated the amounts of protein and energy necessary, and these figures are given in the table (p. 97). It should be noted that these body weights run lower than the American ones quoted in connection with the Baltimore studies (see p. 94). Whether American children really develop faster than European, or whether different methods of weighing account for the variations is not known, but the heavier weights seem safer guides in fixing American standards. While Maurel's maintenance rations provide for normal growth and the exertion required by the performance of involuntary physiological functions, they make no allowance for external muscular work. Considering the activity

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<sup>a</sup> Loc. cit.

and restlessness of most healthy children, it is probable that this would call for considerable extra energy, even though the children have no fixed muscular work such as that entailed upon many adults by their occupations. It would be practically impossible to estimate the energy thus expended, unless possibly by comparisons with and deductions from the results of many more dietary studies than are now available. Meanwhile, Maurel's figures are not only theoretically interesting, but also practically useful as a check on actual dietaries. To be on the safe side it would seem that the food should be in excess of these maintenance values.

In attempting to set up or to apply dietary standards for children, the question of body weight is more important than in adults, both because it is more variable and because it is a measure of the child's proper growth and general development. Various estimates of the average weight of American children at successive ages have been made. Among these may be mentioned those of Boston school children of American parentage, collected by Bowditch,<sup>a</sup> similar ones by Porter<sup>a</sup> in St. Louis, and those of the large life insurance companies. These statistics do not agree as closely as might be wished, differences of 1 or 2 pounds sometimes appearing. Whether the differences are due to methods of weighing, or whether the variations in children's weights are too great to permit of satisfactory averaging, it is impossible to say. When body weights were not given in the original studies those quoted by Holt from life insurance data for children of corresponding ages have usually been employed, in the table on page 94, as representing the largest number of individuals. In a few instances where these were not available those of Bowditch have been used. As has already been pointed out, the American figures all run higher than the French ones quoted by Maurel; although there is no conclusive explanation of this difference, it will be safer, in applying Maurel's maintenance rations to American conditions, to be guided by body weight rather than by age. Considering the bad results of undernutrition in childhood, the benefit of any possible doubt as to the exact requirements of children, especially in institutions, should unquestionably be given to the more generous ration. If, as an English children's specialist, Sir Clement Duke,<sup>b</sup> insists, "a failure in height or weight during growth is the surest indication that the child is not thriving," such symptoms occurring where the daily supply of nutrients is known to be rather low, should raise serious doubts as to the adequacy of the ration.

In a study of undernutrition of school children in New York, which included some 210 cases, E. M. Sill,<sup>c</sup> found that they had been living

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<sup>a</sup> Diseases of Infancy and Childhood. New York, 1902, p. 19.

<sup>b</sup> Remedies for the Needless Injuries to Children, etc. London, 1899.

<sup>c</sup> Jour. Amer. Med. Assoc., 52 (1909), p. 1981.

very largely on bread with tea or coffee; that is, on a diet which was presumably low in both protein and energy, and that they were decidedly under weight—the discrepancy varying from 4 to 16 pounds. The children ranged from 3 to 10 years in age—the majority, however, being 6 to 10 years old. In addition to hygienic measures, these children were provided with a diet containing a generous proportion of proteid foods such as milk, eggs, meat, cereals, etc., which resulted in gains in weight and very marked improvement in other respects.

In this connection it may be interesting to see how the commonly accepted standards for children's dietaries compare with Maurel's maintenance rations, which can be done if the protein and energy per kilogram body weight are calculated as in the following table:

*Children's dietary standards expressed per kilogram of body weight.*

	Grams of protein.	Calories of energy.		Grams of protein.	Calories of energy.
Child, 2-5 years.....	2.43	87.5	Boy, 15-16 years.....	1.77	58.7
Child, 6-9 years.....	2.12	70.0	Girl, 10-12 years.....	2.01	67.1
Boy, 10-11 years.....	2.10	70.0	Girl, 13-14 years.....	1.83	60.6
Boy, 12 years.....	2.09	69.2	Girl, 15-16 years.....	1.66	55.6
Boy, 13-14 years.....	2.18	72.5			

Maurel's maintenance ration, it will be remembered, calls for 1.75 grams of protein per kilogram of body weight from birth to the age of 16, when it is reduced to 1.70 grams, and amounts of energy gradually decreasing for 67.50 calories at birth to 44.25 at 16 years. The common standard for children from 2 to 5 years of age gives an excess of 0.68 gram of protein over this maintenance ration, but this excess gradually decreases in the standards for older children, until for boys from 15 to 16 years it is only 0.02 gram, while for girls from 15 to 16 years there is a deficiency of 0.9 gram. Even if we adopt Maurel's lowered ration of 1.70 grams per kilogram of body weight for children of 16 years, the protein in the last standard for girls falls below the maintenance ration. There is a similar but less marked decrease in the excess of energy in the usual standards over that of the maintenance rations, the excess varying from about 20 calories per kilogram of body weight in the standard for children from 2 to 6 years to 11.3 calories in that for girls of 15 to 16 years. The inferences from these comparisons are obvious; either the American weights used are too large and the standards for younger children are somewhat excessive, or the standards for older children are insufficient to provide for normal amounts of external muscular work. While the weights here used may not be absolutely accurate, there is no reason to suppose that they are greatly above the normal for well-developed American children. In the opinion of the present writers, it is probably nearer the truth, and certainly safer for the present, to

assume that the standards for older children are a trifle low, especially for institution use.

Reducing the data of the present studies in children's homes as summarized in the table on page 94 to the basis of protein and energy supplied per kilogram of body weight, we obtain the following results:

*Protein and energy per kilogram of body weight in children's dietaries.*

Institution.	Grams of protein.	Calories of energy.
Maryland Home for Friendless Colored Children.....	1.88	63.0
General German Orphan Asylum.....	2.15	59.3
Philadelphia Orphanage.....	2.29	63.2
Average.....	2.01	58.7

In the first of these studies there are only 0.13 gram of protein and 9 calories of energy in excess of the amounts set up by Maurel as a maintenance ration for children of corresponding weight. In the diet of the German Orphan Asylum there is an excess of 0.4 gram protein, but only 6.8 calories more energy than in the maintenance ration. In the Philadelphia study 0.54 gram of protein and 11.7 calories of energy were supplied in excess of Maurel's maintenance ration.

While it is impossible to estimate the amount of external muscular work performed by the children in these studies, they are known to have been moderately active, and it seems impossible that their diet can have been excessive in either protein or energy. On the other hand, it is questionable whether the protein in the first study or the energy in the second can have been sufficient for their best development. It was noted in the individual discussions of these two studies that while the nutrients and energy supplied by the diets corresponded fairly closely to the generally accepted standards, the children appeared to the observer to be rather below the average in general physical development. While there was little sickness in the institutions, the children gave the impression of being younger than they were, and this before any effort had been made to weigh them. In the case of the German Orphan Asylum the body weights were carefully taken, so that there is little likelihood of error from that source. Here again, as in the case of the standards for older children, the most reasonable deduction seems to be that the present standards for children from 9 to 12 years old are a trifle low. Many more observations of the diet of normal children are necessary before the exact amounts required can be determined. In the light of our present knowledge it seems fair to conclude that it would not be wise to allow anything below the standard amounts in children's diets, and in most cases dietitians would be quite justified in exceeding them somewhat.















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